CITY OF LOWELL, MASSACHUSETTS

BOARD OF HEALTH

AGENDA: Board of Health JANUARY 8,2020 at 6:00 P.M. in the Mayor's Reception Room, 375 Merrimack St., 2nd floor, Lowell, MA 01852.

DECEMBER 20, 2019

Michael Geary, City Clerk 375 Merrimack Street Lowell, Massachusetts 01852

Dear Mr. Geary: In accordance with Chapter 303 of the Acts of 1975 you are hereby notified that a meeting of the Lowell Board of Health will be held on Wednesday, JANUARY 8, 2020 @ 6:00 P.M. in the Mayor's Reception Room, 375 Merrimack St., 2nd floor, Lowell, MA 01852.

AGENDA:

1. New Business

1.I. Election: Election Of An Acting Chair Of The Lowell Board Of Health
Vote: To Elect an Acting Chair of the Lowell Board of Health

1.II. For Acceptance: Minutes Of The December 11, 2019 Meeting Of The Board Of Health.
Motion: To accept the minutes of the December 11, 2019 meeting of the Board of Health.

Documents:

BOH MINUTES - DRAFT DECEMBER 11, 2019.PDF

1.III. For Review: Tobacco Control Monthly Report Submitted By Cesar Pungirum, Program Director.

Documents:

TOBACCO CONTROL MONTHLY REPORT_DEC2019.PDF

1.IV. Monthly Development Services Report Submitted By Senior Sanitary Code Inspector Shawn Machado.

Documents:

DEVELOPMENT SERVICES FOOD INSPECTION REPORT 1-8-20.PDF
DEVELOPMENT SERVICES -FAILED FOOD INSPECTION REPORT.PDF

DEVELOPMENT SERVICES - BODY ART INSPECTIONS DECEMBER 2019.PDF

1.V. Discussion: Body Art - Jeff Riel Apprentice License

Discussion regarding Jeffrey Riel's Apprentice LIcense and lack required of documentation as required by the Body Art Regulations

Motion: To revoke/suspend the Body Art Apprentice License issued to Jeffrey Riel on May 8, 2019.

Documents:

JEFFREY RIEL MISSING DOCUMENTATION.PDF

1.VI. For Review: Trinity EMS Inc. Reports

Review of Trinity EMS, Inc. Monthly Opioid Report submitted by Jon Kelley.

Documents:

TRINITY EMS OVERDOSE REPORT NOVEMBER 2019.PDF
TRINITY EMS OPIOID RELATED ILLNESS CALLS IN LOWELL MA 2019 - HANDOUT.PDF

2. Old Business

2.I. Update: Massachusetts DPH BEH Indoor Air Quality Control Report - Lowell High School

Pending Availability: October 28, 2019 Lowell High School Re-inspection Report

Documents:

LOWELL-HS-1920S-REASSESS-DEC-2019 - HANDOUT.PDF
HANDOUT - COMMUNICATION - STATUS SUMMARY OF LOWELL HIGH SCHOOL INDOOR AIR QUALITY REASSESSMENT REPORTS - C. CLANCY.PDF
LOWELL-HS-1980S-REASSESS-DEC-2019 - HANDOUT.PDF

2.II. Update: Service Zone Plan.

Pending Availability: Update on Service Zone Plan.

3. Director's Report

3.I. Update: Divisional And Departmental Updates

Documents:

COMMUNITY HEALTH DIVISION REPORT 1.8.20.PDF
PUBLIC HEALTH DIVISION REPORT - NOVEMBER 2019 1.8.20.PDF
SCHOOL HEALTH DIVISION NOV 2019 BOH REPORT.PDF
SUBSTANCE ABUSE AND PREVENTION DIVISION BOH REPORT 01-08-2020.PDF

4. Motion: To Adjourn.

THE NEXT MEETING OF THE BOARD OF HEALTH WILL BE ON FEBRUARY 5, 2020
AT 6:00 PM IN THE MAYOR'S RECEPTION ROOM.

CITY OF LOWELL, MASSACHUSETTS

BOARD OF HEALTH

December 11, 2019

A meeting of the Lowell Board of Health was held on Wednesday, December 11, 2019 in the Mayor's Reception Room, City Hall, 375 Merrimack St., Lowell, MA 01852. Chairwoman Jo-Ann Keegan called the meeting to order at 6:03 P.M.

Present:
Jo-Ann Keegan, Chairperson
John Donovan, Board Member
William Galvin, Board Member
Lisa Golden, Board Member
Kathleen Cullen-Lutter, Board Member
Cesar Pungirum, Tobacco Control Director
Shawn Machado, Sr. Sanitary Code Inspector

12/11/2019 - Minutes

1. NEW BUSINESS

1.I. For Acceptance: Minutes Of The November 6, 2019 Meeting Of The Board Of Health.
Motion: To accept the minutes of the November 6, 2019 meeting of the Board of Health made by William Galvin, seconded by Kathleen Cullen-Lutter. All in favor.

1.II. For Review: Tobacco Control Monthly Report Submitted By Cesar Pungirum, Program Director.
Mr. Cesar Pungirum, Tobacco Control Director, reviewed the report with the Board. Mr. Pungirum informed the Board that the Massachusetts ban on vaping products ceased today. A new law regarding vaping products was passed into law. Mr. Pungirum will be attending a webinar to learn more about the new law and suggested tabling the current discussion regarding the change of the Board of Health Tobacco Regulations previously discussed by the Board until he has more information to present to them.

Motion: To table discussions on the Board of Health Tobacco Regulations revisions until more information is available made by William Galvin, seconded by John Donovan. All in favor.

1.III. Monthly Development Services Report Submitted By Senior Sanitary Code Inspector Shawn Machado.
Mr. Shawn Machado, Sr. Sanitary Code Inspector, reviewed the report with the Board. Mr. Machado noted that complaints about rodents in the schools are down and he will be following up on the Lincoln School sprayer hose.

1.IV. Body Art Establishment and Practitioner Renewals For 2020
Motion: To approve the Body Art Facilities 2020 licenses made by Lisa Golden, seconded by Kathleen Cullen-Lutter. All in favor.

Motion: To approve the Body Art Practitioner 2020 license with the exception of Chamroeun Yan made by Lisa Golden, seconded by William Galvin. All in favor.

DRAFT

Motion: To approve the Body Art Practitioner 2020 license for Chamroeun Yan if the application and payment is received by December 31, 2019 if the application is not received by the stated date, Mr. Yan will have to restart the application process for further licensing made by William Galvin, seconded by John Donovan. All in favor. .

1.V. For Review: Trinity EMS Inc. Reports
The Board reviewed and placed on file.

Motion: To request Health & Human Services Director Kerran Vigroux to obtain a copy of the CDC HIV report for the Board's review made by William Galvin, seconded by Lisa Golden. All in favor.

1.VI. Communication: Central Massachusetts Mosquito Control Program 2020 Meeting Schedule
The Board accepted and placed on file.

2. OLD BUSINESS

2.I. For Review: 2020 Board Of Health Meeting Schedule
The Board accepted and placed on file.

2.II. Update: Service Zone Plan.
The Board requested a report on the status of the Service Zone Plan for the January 8, 2020 meeting.

3. DIRECTOR'S REPORT

3.I. Update: Divisional and Departmental Updates.
The Board accepted the reports and placed on file.

The Board requested that the Air Quality Control report for the December 2019 re-inspection be placed on the agenda for the January 8, 2020 meeting.

4. Motion: To Adjourn.
Motion: To adjourn at 6:45 PM made by john Donovan, seconded by William Galvin. All in favor.

THE NEXT MEETING OF THE LOWELL BOARD OF HEALTH WILL BE HELD ON JANUARY 8, 2020 AT 6:00 PM IN THE MAYOR'S RECEPTION ROOM.

DRAFT

Lowell Tobacco Control Monthly Report
December/2019

Prepared by: Cesar Pungirum, M.M., J.D.
Program Director

Lowell

Inspections

I've conducted 21 routine inspections so far this month. During these inspections All retailers inspected were in compliance with the new state law restricting the sale of vaping products.

Pricing Surveys

Eleven pricing surveys conducted this month, so far.

Compliance Checks

I've conducted 28 compliance checks on cigarettes in Lowell with a 16-year-old youth. No sales.

Permit Renewal Process

As of December 19th, I've processed 111 tobacco permit renewal applications out of 116 total number of retailers. One hundred and nine permits have been issued and mailed. The remaining 2 applications are pending the payment of taxes owed to the city.

Governor Signed New Law: An Act Modernizing Tobacco Control

On 11/27/19 Governor Baker signed the above bill into law, which among other things, prohibits the sale of all flavored tobacco and vaping products, including menthol cigarettes, except at "smoking bars". Portions of the law that applies to vaping products went into effect immediately. The restrictions on the sale of other flavored tobacco products will go into effect on June 1, 2020. Violations of the new law are subject to fines ranging from $1,000 to $5,000. *See attached article*

Emergency Ban on the Sale of Vaping Products Lifted

The temporary ban that had been in effect since September was lifted on December 11th. On the same day, the Massachusetts Public Health Council promulgated new regulations to help enforce the new state law. The regulations give Boards of Health the authority to enforce the provisions of the new state law without the need to adopt local regulations containing similar provisions. *See attached article*

HOURLY NEWS
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LAW

Massachusetts Governor Signs Law Severely Restricting Flavored Tobacco, Vape Products

November 27, 2019 · 3:32 PM ET

VANESSA ROMO

The newly signed law is set to take effect on June 1, 2020. A temporary blanket ban on all vaping products will remain in place until Dec. 11.

Steven Senne/AP

Massachusetts Gov. Charlie Baker on Wednesday signed sweeping legislation to restrict the sale of flavored tobacco and vaping products, making his state the first to enact such stringent controls.

The new law, which is set to take effect on June 1, 2020, is not a blanket ban. Instead, it limits the sale of flavored nicotine vaping products, including menthol, "to licensed smoking bars where they may only be smoked on-site." The same restrictions apply to all other flavored tobacco products, including menthol cigarettes and flavored chewing tobacco.

Baker did not offer details on how the state intends to enforce the law.

The legislation, titled An Act Modernizing Tobacco Control, also imposes a 75% excise tax on e-cigarettes — meant to reduce their appeal to young people by making the products too expensive for minors.

"It's pretty clear there isn't going to be a federal policy on this anytime soon," Baker said at the signing. "So in the absence of that, we had to act."

Baker declared a public health emergency in September and issued a four-month ban on all vaping products, following mysterious lung illnesses and deaths nationwide that were linked to vaping. The temporary blanket ban was set to expire in late January, but on Wednesday, the governor said it will end on Dec. 11.

Article continues below

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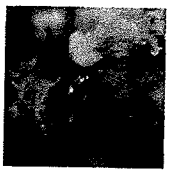
"In light of the growing health crisis associated with e-cigarettes and vaping, our administration implemented a temporary ban on the sale of e-cigarette and vaping products to provide time for legislative and regulatory bodies to better understand what's making people sick and act to protect the health of Massachusetts residents," Baker said in a statement emailed to NPR.

BUSINESS

How Vaping Snuck Up On Regulators

He went on to add that the temporary ban will remain in place "as the Department of Public Health develops permanent regulations that will ensure risks are known to consumers, clarify what interventions DPH can take to address clear risks identified by the developing science, and ensure sellers are not skirting the new law and selling to kids."

The Centers for Disease Control and Prevention says 47 people have died from unknown lung disease related to e-cigarettes as of Nov. 20. Since then, nearly 2,300 cases of lung injury associated with the use of e-cigarette or vaping products have been reported to the CDC in 49 states, the District of Columbia, as well as Puerto Rico and U.S. Virgin Islands. The only state that hasn't yet reported any illnesses is Alaska.



SHOTS - HEALTH NEWS

Vitamin E Suspected In Serious Lung Problems Among People Who Vaped Cannabis

Researchers have identified a vitamin E compound often used as an additive to THC, the psychoactive ingredient in marijuana, as a possible cause of the lung injuries. While vitamin E is a common dietary supplement and is also found in lotions, it can be extremely harmful when it's vaped in high concentrations, New York Health Commissioner Howard Zucker recently told NPR.

It ultimately causes an inflammatory process in the lung, Zucker said. "The body is trying to fight off a foreign substance deep in the lung," he added.

Vaping businesses in Massachusetts have been protesting the temporary ban and the threat of looming restrictions since they were first proposed.

"The people that were applauding the governor the loudest were the criminals and gangs that already operated in the states illegal black market," Jon Shaer, executive director of the New England Convenience Store & Energy Marketers Association, told NPR.

The industry group campaigned for months to stop the inclusion of menthol and mint tobacco products in the newly signed legislation, arguing it will have detrimental effects on public safety because consumers will be pushed out of the regulated market and turn to illicit sellers. Shaer also said the new law will have a disproportionate impact on communities of color because they consume more menthol and mint products than any other demographic.

Meanwhile, anti-smoking advocacy groups welcomed the Massachusetts law.

"Absent strong action from the federal government, we urge states and localities to follow Massachusetts' lead," Harold Wimmer, national president and CEO of the American Lung Association, said in a statement.

Wimmer also praised parts of the law requiring retailers to contribute to tobacco cessation and prevention programs."This law is a major win for the residents of Massachusetts and will positively impact statewide tobacco use rates, tobacco related death and disease, and tobacco related health costs."

He added: "Clearing the market of all flavored tobacco products is critical to addressing the youth e-cigarette epidemic."

HEALTH

Trump Administration's Efforts To Ban Most Flavored Vaping Products Have Stalled Out

LISTEN · 3:28 PLAYLIST Download

Transcript

In September, President Trump indicated support for a national ban on flavored vapes because those products are known to attract teens to vaping but he later moved away from that position. Last week, he hosted a "listening session" on e-cigarette use by minors that included representatives from the vaping and tobacco industries as well as public health advocates.

Trump expressed skepticism at the meeting that such a ban is the right move, noting how Prohibition spurred a black market for alcohol. He suggested the administration might instead raise the legal age to buy e-cigarettes to 21 from 18.

flavored tobacco vape ban vaping illness vaping e-cigarettes massachusetts

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NEWS

Gov. Charlie Baker's controversial vape ban officially lifted for nicotine

Pot vapes still off limits

FILE – In this Friday, Oct. 4, 2019 file photo, a woman using an electronic cigarette exhales a puff of smoke in Mayfield Heights, Ohio. Massachusetts lawmakers have approved the nation's toughest restrictions on flavored tobacco and vaping products, including menthol cigarettes. The ban was passed by the Senate early Thursday, Nov. 21, before the legislature broke for a holiday recess. It had earlier been passed by the state House of Representatives. (AP Photo/Tony Dejak)

By **ALEXI COHAN** | alexi.cohan@bostonherald.com | Boston Herald

PUBLISHED: December 11, 2019 at 1:35 pm | UPDATED: December 11, 2019 at 3:24

Gov. Charlie Baker's controversial vape ban that was prompted by mysterious vaping-related lung illness was lifted Wednesday after a vote from the Public Health Council.

The sale of all unflavored nicotine vapes can continue at Massachusetts retailers as long as they stick to some strict new regulations, but flavored tobacco products have been banned in the Bay State since Baker signed An Act Modernizing Tobacco Control last month.

Critics said in banning all vapes by emergency executive order Sept. 25, Baker acted without any scientific health data. Subsequent studies by the Centers for Disease Control have found most vaping injury and death appear to be linked to oils associated with marijuana vapes. In Massachusetts, vape business owners said they were put out of business arbitrarily, forced to close their doors and losing income.

In Massachusetts, there have been three deaths associated with vaping. Nationwide, dozens have died and thousands have been sickened.

The Public Health Council voted unanimously to lift the ban on nicotine vape products and to implement regulations from a new tobacco control law.

The sale of marijuana vapes is still halted due to a Cannabis Control Commission quarantine on the products. Medical marijuana card holders can still access flower vapes.

The new tobacco regulations require vape shops to post warnings about the dangers of vaping and place vaping products behind the counter.

"What the regulations do is allow a regulatory and legal framework to limit the access to these products, put in place warnings and signages so people can understand their risk and, importantly, limit access for youth and young people," said DPH Commissioner Dr. Monica Bharel.

The regulations also prohibit the sale of out-of-package tobacco or vaping cartridge refills and require that all vaping liquid containing nicotine be packaged in child-resistant packaging.

Herald wire services contributed to this report.

Establishment	#	Street	Prior Inspection	Inspector 2	Last Inspection	Inspector-1
Rte. 110 Mart	137	Andover St.	14-Jun-19	Lisa	13-Dec-19	Lisa
Vinaan Café	12	Cardinal O'Connell Pkwy	20-Jun-19	Aurea	13-Dec-19	Aurea
Tremonte Pizzeria *	44	Palmer St.	26-Aug-19	Adam	13-Dec-19	Adam
Lemon and Thyme	491	Dutton St	26-Jun-19	Aurea	12-Dec-19	Aurea
Showcase Cinema	32	Reiss Ave	18-Jun-19	Aurea	12-Dec-19	Aurea
Outback Steakhouse	28	Reiss Ave.	18-Jun-19	Aurea	12-Dec-19	Aurea
The Grip Program	319	Wilder St.	24-Jun-19	Adam	12-Dec-19	Adam
Vicki's Coffee Shop	513	Broadway St.	27-Jun-19	Adam	11-Dec-19	Adam
Parker St. Variety	322	Parker St.	11-Jun-19	Aurea	11-Dec-19	Aurea
Rancho Tipico	11	Salem St.	20-May-19	Adam	11-Dec-19	Aurea
Windsor Shoppe	583	Westford St.	11-Jun-19	Aurea	11-Dec-19	Aurea
Sugar and Ice	16	Branch St.	14-Jun-19	Shawn New	10-Dec-19	Aurea
Siagon Sandwich House	507	Dutton St	05-Jun-19	Aurea	10-Dec-19	Aurea
Lowe's	50	Lowe's Way	19-Jun-19	Adam	10-Dec-19	Adam
Blue Shamrock Pub	105	Market St.	16-May-19	Jimmy	10-Dec-19	Jimmy
Aramark Fox Hall	100	Pawtucket St.	26-Sep-19	Jimmy	10-Dec-19	Jimmy
Chili's Grill & Bar	26	Reiss Ave.	04-Jun-19	Adam	10-Dec-19	Adam
Aramark Southwick Food Court	1	University Ave	23-Sep-19	Jimmy	10-Dec-19	Jimmy
Olympos Bakery	216	Broadway St.	03-Jun-19	Aurea	09-Dec-19	Aurea
China Star *	369	Broadway St.	19-Jun-19	Aurea	09-Dec-19	Aurea
I.S.S.O.	1705	Middlesex St.	20-May-19	Aurea	05-Dec-19	Aurea
P & D Mart	1717	Middlesex St.	03-Jun-19	Aurea	05-Dec-19	Aurea
Udupi Bhavan	1717	Middlesex St.	05-Jun-19	Aurea	05-Dec-19	Aurea
American & Hispanic Market	279	Chelmsford St.	14-Jun-19	Aurea	04-Dec-19	Aurea
Wah Sang	457	Chelmsford St.	04-Jun-19	Aurea	04-Dec-19	Aurea
All Town	980	Chelmsford St.	01-May-19	Aurea	04-Dec-19	Aurea
Dunkin Donuts	980	Chelmsford St.	01-May-19	Aurea	04-Dec-19	Aurea
Family Dollar	21	Nothingham St	16-May-19	Aurea	04-Dec-19	Auera
New World Gas	710	Lakeview Ave.	21-May-19	Jimmy	27-Nov-19	Jimmy
Godwin African Market	134	Merrimack St.	29-May-19	Adam	27-Nov-19	Adam
Centerville Social Club	364	W Sixth St.	28-May-19	Jimmy	27-Nov-19	Jimmy
Arara Market	6	Branch St.	15-May-19	Aurea	26-Nov-19	Aurea
Palin Restaurant	6	Branch St.	15-May-19	Aurea	26-Nov-19	Aurea
African Central Market	63	Fletcher St.	28-Jun-19	Adam	26-Nov-19	Jimmy
LePetit Club	660	Middlesex St.	06-May-19	Aurea	26-Nov-19	Aurea
Jade East International	1126	Middlesex St.	30-May-19	Jimmy	26-Nov-19	Jimmy
Paradise Biryani Pointe	1689	Middlesex St.	06-May-19	Aurea	26-Nov-19	Aurea
Kentucky Fried Chicken	1720	Middlesex St.	02-May-19	Aurea	26-Nov-19	Aurea
Five Below	203	Plain St.	01-May-19	Aurea	26-Nov-19	Aurea
Chuck E. Cheese	209	Plain St.	27-May-19	Aurea	26-Nov-19	Aurea
Marshall's	211	Plain St.	28-May-19	Aurea	26-Nov-19	Aurea
Mambu	199	Plain St., #8	01-May-19	Aurea	26-Nov-19	Aurea
Broadway Pizza & Seafood	651	Broadway St.	06-May-19	Aurea	25-Nov-19	Aurea
Pub Ram @ Charlies's LLC	14	Cabot St.	08-May-19	Aurea	25-Nov-19	Aurea
C.V.S. #1056-	1815	Middlesex St.	30-May-19	Jimmy	25-Nov-19	Jimmy
Prathna, Inc.	408	Suffolk St.	23-May-19	Aurea	25-Nov-19	Aurea

Neak Pich	301	Westford St	16-May-19	Aurea	25-Nov-19	Aurea

Failed Food Establishments

Meeting 1-8-20

Gary's Tipico – 26 Andover St 12/4/19

Front windows damaged (one cracked and one removed and replaced with plywood) / Repair both within ten days.

Function room men's room has a large AC unit draining in the sink / Remove from sink within ten days.

Ceiling tiles in dry-storage stained and damaged / Replace within ten days.

Cover of furnace in attic missing / repair within twenty-four hours

Reinspection: 12/17/19

Last three inspections: All passed

P and D Mart – 1717 Middlesex St 11/20/19

Expired food on shelves / remove immediately

Fire extinguisher out of date / Get serviced within ten days.

Refrigerator unclean and disorganized / Clean and organize immediately

Ice machine is dirty / Clean immediately

Kitchen filled with clutter / declutter within ten days.

Reinspection:12/5/19 Compliance

Last three inspections: All passed

Lemon and Thyme – 491 Dutton St 12/10/19

Fire extinguisher out of date / must get serviced

Ice machine is dirty / clean immediately

Reinspection: 12/12/19 Compliance

Last three inspections: All passed

NOVEMBER 2019 BODY ART AND PIERCING INSPECTIONS FOR DECEMBER 11, 2019 BOH MEETING			
NAME OF BUSINESS	**DATE INSPECTED**	**STATUS**	**INSPECTED BY**
Professional Body Piercing 147 Central Street, Lowell	**12/13/19**	**PASSED**	**Don Murphy**
Lowell Ink 161 Worthen Street, Lowell	**12/17/19**	**PASSED**	**Don Murphy**
Tierney's Body Art 12 Concord Street, Lowell	**12/17/19**	**PASSED**	**Don Murphy**
Blaq Sheep Tattoos 564 Dutton Street 2nd Fl, Lowell	**12/17/19**	**PASSED**	**Don Murphy**
Lupo Ink 1527 Middlesex St. #8, Lowell	**12/17/19**	**PASSED**	**Don Murphy**

Jeffrey Riel Missing Documentation

1. Proof of third Hep B vaccination.
2. Up to date identification: i.e. current driver's license/state identification.
3. Updated Blood Borne Pathogen's Certificate.
3. Submittal of monthly time logs and task sheets for the time period of May - November 2019.

TRINITY
EMERGENCY MEDICAL SERVICE

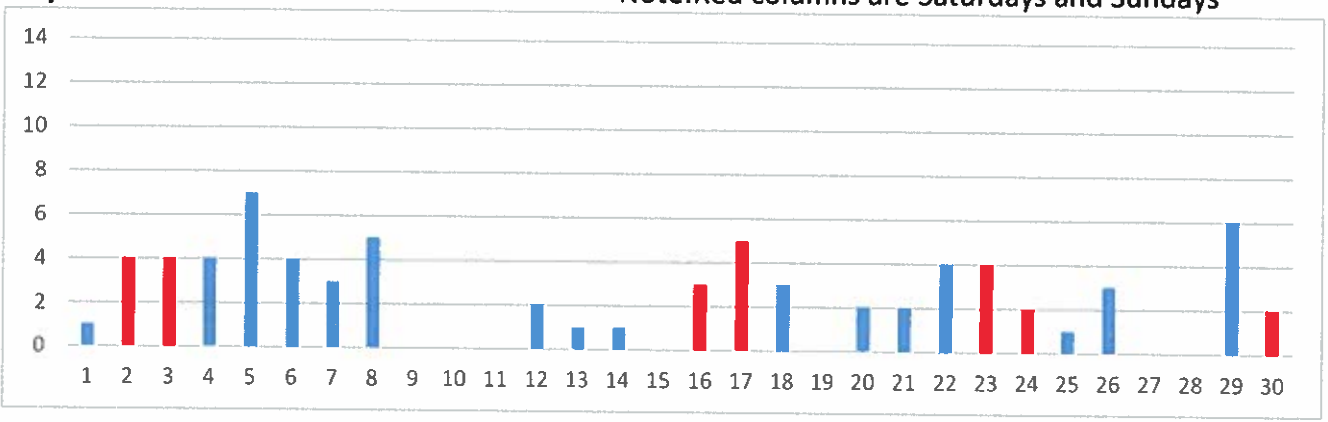
Overdose Report: **19-Nov** **Lowell, MA**

Overdoses: 73 or 2.4 per day

Day of the week:

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun	
Count	8	12	7	6	16	13	11	73
Average	2.0	3.0	1.8	1.5	3.2	2.6	2.8	

Day of the month: Note:Red columns are Saturdays and Sundays



Hour of the day:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
3	3	2	2	3	0	3	1	1	1	1	2	7	3	5	6	1	4	4	4	5	3	7	2

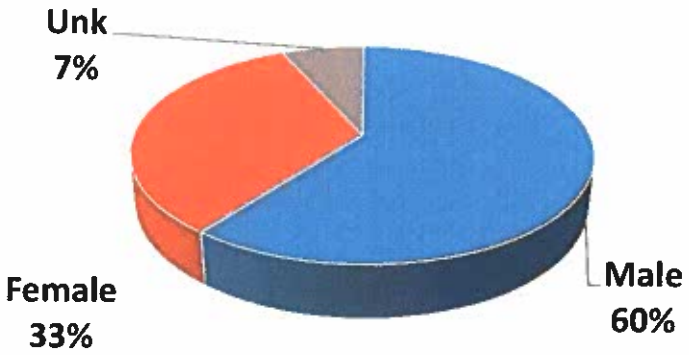
73

Section of the city:

Neighborhood	Count
Acre	9
Back Central	11
Belvidere	4
Centralville	19
Downtown	12
Highlands	7
Lower Belvidere	1
Lower Highlands	4
Pawtucketville	6
Sacred Heart	0
South Lowell	0
	73

Profile of patient

Sex	Count	Avg Age	Range
Female	24	36	11-74
Male	44	35	14-66



Age	#
12 and U	1
13-15	2
16-17	4
18-21	1
22	0
23	1
24	2
25	4
26	2
27	2
28	2
29	3
30	5
31	2
32	3
33	1
34	0
35	2
36	4
37	7
38	0
39	1
40	0
41	1
42	1
43	0
44	3
45	0
46	1
47	0
48	1
49	0
50	0
51-55	6
56-60	1
61-65	0
66-70	1
71 and up	2
Unk	7

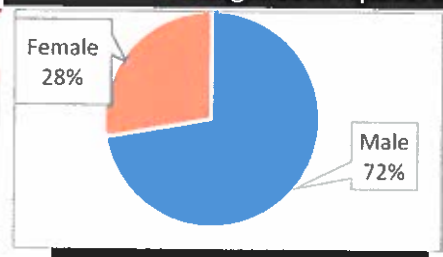
18-Nov	18-Dec	19-Jan	19-Feb	19-Mar	19-Apr	19-May	19-Jun	19-Jul	19-Aug	19-Sep	19-Oct	19-Nov
140	125	86	90	111	96	111	93	97	100	83	107	73
4.7	4.0	2.8	3.2	3.6	3.2	3.6	3.1	3.1	3.2	2.8	3.5	2.4

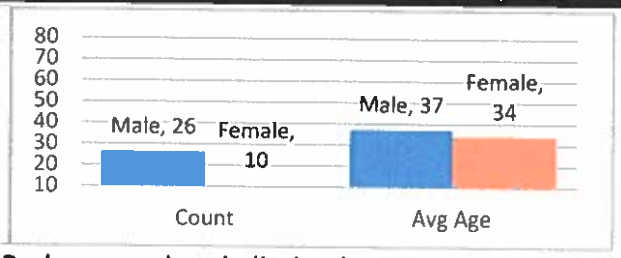
TRINITY EMERGENCY MEDICAL SERVICE

Categorized Opiate Report: Nov-19 Lowell, MA

Priority of patient

Priority 1	23
Priority 2	2
Priority 3	11

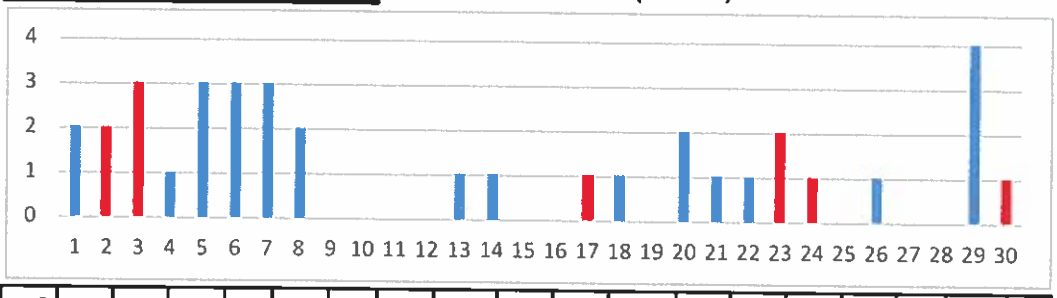




Age	
12 and U	0
13-15	0
16-17	0
18-21	0
22	0
23	1
24	1
25	1
26	2
27	1
28	2
29	1
30	3
31	1
32	3
33	1
34	0
35	2
36	3
37	4
38	0
39	1
40	0
41	0
42	1
43	0
44	3
45	0
46	0
47	0
48	1
49	0
50	0
51-55	4
56-60	0
61-65	0
66-70	0
Unk	0

Day of the week:	#	Avg
Mon	2	0.5
Tue	4	1.0
Wed	6	1.5
Thu	5	1.3
Fri	9	1.8
Sat	5	1.0
Sun	5	1.3

Day of the month: Red are weekends (below)



Hour of the day:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	1	3	0	1	1	0	2	0	0	1	0	2	2	3	2	2	0	2	3	4	2	1	3	1

Location of patient	#
Private Residence	19
Public Location- Inside	3
Public Location- Outside	14
Residential Institutuion	0

Narcan used by:			
Lowell FD	13	Lowell PD	6
Trinity ALS	1	Trinity BLS	1
LGH ALS	2	Other	5
Park Ranger	0		

Narcan doses	
1-2mg - 3	
4mg - 9	
6mg - 3	
8mg+ - 7	

Neighborhood: Acre - 6, Back Central - 6, Belvidere - 2, Centralville - 11, Downtown - 6, Lwr Highlands - 2, Pawtucketville - 2, Unknown - 1

Home town of pt: Derry - 1, Dracut - 2, Haverhill - 2, Hyannis - 1, Lawrence - 1, Lowell - 23, Southbridge - 1, Tewksbury - 1, Townsend - 1, Unknown - 3

Last 12 months All ORI calls

18-Nov	18-Dec	19-Jan	19-Feb	19-Mar	19-Apr	19-May	19-Jun	19-Jul	19-Aug	19-Sep	19-Oct	19-Nov
69	59	42	49	43	47	46	44	46	35	46	52	36
2.3	1.9	1.4	1.8	1.4	1.6	1.5	1.5	1.5	1.1	1.5	1.7	1.2

Last 12 months Priority 1 only

18-Nov	18-Dec	19-Jan	19-Feb	19-Mar	19-Apr	19-May	19-Jun	19-Jul	19-Aug	19-Sep	19-Oct	19-Nov
46	32	23	21	23	28	25	30	26	26	27	34	23
1.5	1.0	0.7	0.8	0.7	0.9	0.8	1.0	0.8	0.8	0.9	1.1	0.8

ORI - daily average

	Q1	Q2	Q3	Q4	Yr avg
2013	0.7	1.2	1.1	0.6	0.9
2014	0.8	1.4	1.6	1.4	1.3
2015	1.4	1.7	1.9	1.4	1.6
2016	1.7	1.6	2.0	2.3	1.9
2017	2.0	2.3	2.8	1.8	2.2
2018	2.1	2.0	2.6	2.2	2.2
2019	1.5	1.5	1.4	1.4	

Priority 1 only- daily average

	Q1	Q2	Q3	Q4	Yr avg
2013	0.3	0.4	0.5	0.2	0.3
2014	0.3	0.6	0.8	0.9	0.7
2015	0.8	0.7	0.9	0.8	0.8
2016	1.0	1.0	0.9	1.3	1.0
2017	1.2	1.4	1.6	1.0	1.3
2018	1.2	1.1	1.3	1.4	1.3
2019	0.7	0.9	0.9	0.9	

The following data is from Trinity EMS electronic Patient Care Reports. This data is from calls in all 13 communities Trinity provides service for. Only data from November 2019 opioid related calls are included

Trinity EMS Inc provides EMS services for the following communities in MA: Boxford, Chelmsford, Dunstable, Groveland, Haverhill, Lowell, and Dracut. In NH: Atkinson, Danville, Hampstead, Newton, Plaistow, and Sandown.

Only opiate overdoses that Trinity EMS inc responded to are included. If someone from one of the communities listed above overdosed in another community not listed, it will not be represented in this data set.

System wide, Trinity treated 56 patients with an opioid related issue in November 2019.

Row Labels	Count of Date
LOWELL	23
HAVERHILL	14
(blank)	4
DRACUT	2
LAWRENCE	2
SOUTHBRIDGE	1
DERRY	1
TOWNSEND	1
HYANNIS	1
PLAISTOW	1
BROCKTON	1
TEWKSBURY	1
CHELMSFORD	1
DUNSTABLE	1
METHUEN	1
NORTH BILLERICA	1
Grand Total	**56**

HANDOUT 1.8.19

Opioid Related Illness calls in Lowell MA 2019

Executive Summary: The City of Lowell MA saw **a 35.51% decrease** in Opioid Related Illness (ORI) on 911 calls when comparing 2019 (523 ORI) to 2018 (811 ORI). Lowell also saw a 31.21% decrease (455 in 2018, 313 in 2019) in patients that required Naloxone (Narcan) and breathing support to reverse a near fatal overdose.

2019 Data: There were 523 ORI 911 calls in Lowell, MA during 2019.

Severity of patient

- 313 Priority 1 patients
  - These patients required Narcan and breathing support to save them
- 97 Priority 2 patients
  - These patients all used an opioid and showed side effects of the drug but did not require Narcan
- 113 Priority 3 patients
  - These patients all used an opioid but did not show significant change in their medical status because of the usage

Location of the patients

- 220 (45%) of the ORI occurred in a public location outside (usually a park or sidewalk)
- 186 (38%) of the ORI occurred inside a private home
- 69 (14) of the ORI occurred inside a public location inside (coffee shop, restaurant, public building)
- 8 (2%) of the ORI occurred in a cell block
- 3 (1%) of the ORI occurred in a health care institute

	Acre	Back Central	Belvidere	Central -ville	Downtown	Highlands	Lwr Belv	Lwr Highlands	Pawtucket-ville	Sacred Heart	South Lowell
ORI	63	82	17	68	138	36	11	51	25	21	11
of Total	12%	16%	3%	13%	26%	7%	2%	10%	5%	4%	2%

When

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ORI	42	49	43	47	46	44	46	35	46	52	36	37
Of total	8%	9%	8%	9%	9%	9%	9%	7%	9%	10%	7%	7%

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
ORI	68	64	78	68	96	80	69
Of total	13%	12%	15%	13%	18%	15%	13%

Thursday, January 02, 2020

Hometowns

- **Lowell** **314** 60% of the ORI patients relayed that they lived in Lowell
- Non listed 48
- **Dracut** **20**
- **Billerica** **19**
- Lawrence 14
- **Tewksbury** **11**
- Haverhill 8
- **Chelmsford** **7**
- **Westford** **6**
- **Tyngsboro** **3**
- **41 other communities listed with between 1 and 5 patients**

Gender

29% of the patients were females. These patients had an average age of 37.4 years old. Their ages ranged from 13-62.

71% of the patients were males. These patients had an average age of 38.8 years old. Their ages ranged from 17 – 72.

Frequency of Patients

- 1 patient had 7 ORI calls with EMS via 911
- 2 patients had 6 ORI calls with EMS via 911
- 2 patients had 5 ORI calls with EMS via 911
- 9 patients had 4 ORI calls with EMS via 911
- 14 patients had 3 ORI calls with EMS via 911
- 45 patients had 2 ORI calls with EMS via 911
- 326 patients had 1 ORI call with EMS via 911

Narcan

Note: The number represents the amount of times that a specific agency gave Narcan to a person.

- If Lowell Fire gave 1 patient two doses of Narcan that would count once in this section.
- If a bystander and Lowell Police each gave the same patient a dose of Narcan that would count as 1 for each
- These totals are from Trinity EMS patient care reports. Specific agencies may have more accurate totals.

- Lowell Fire gave 106 patients Narcan
- Lowell Police gave 34 patients Narcan
- Bystanders/Family gave 85 patients Narcan
  - **27% of all near fatal opioid overdoses in Lowell, the first dose of Narcan was given before 911 arrived**
- Trinity EMS gave 92 patients Narcan
- Lowell General Hospital ALS gave 27 patients Narcan

All the data contained in this report was generated via Trinity EMS patient care reports. Any overdose that happened outside of 911 is not included.

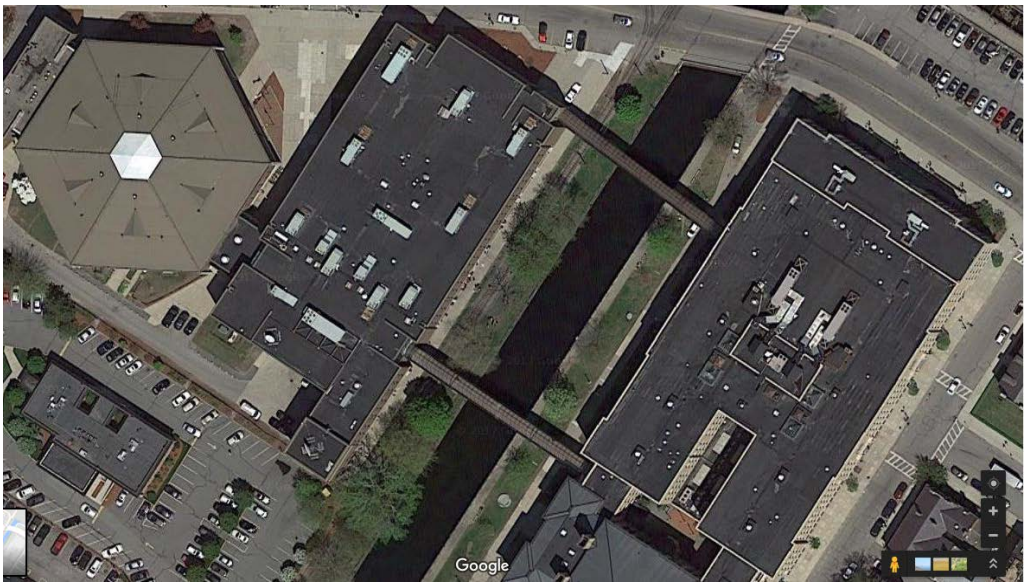
Please email any questions to Jon Kelley at JKELLEY@TRINITYEMS.COM

Thursday, January 02, 2020

BOH HANDOUT 1/8/20
APPENDIX B & C ADDED

INDOOR AIR QUALITY REASSESSMENT

Lowell High School
1922 Building
14 French Street
Lowell, MA



Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
December 2019

Background

Building:	Lowell High School (LHS)
Address:	14 French Street, Lowell, MA
Assessment Coordinated Through:	Lowell Public Schools
Reason for Request:	Reassessment based on actions taken since the previous visit in 2017.
Date of Assessment:	October 25, 2019
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Jason Dustin, Environmental Analyst' Cory Holmes, Environmental Analyst, Ruth Alfasso, Environmental Engineer, and Mike Feeney Director, Indoor Air Quality Program (IAQ)
Building Description:	The Building at 14 French Street was built in 1922 and has brick and concrete construction in a complex shape. This building is connected to the building at 50 Father Morissette Boulevard by several enclosed walkways.
Windows:	Openable

This school was visited previously in 2017. Two visits were made: one during the summer when the school was unoccupied and again in the fall during normal occupancy. Recommendations were made in a report following each visit. The MDPH/IAQ Program returned to the school this year for a follow-up visit, in part to assess the response to recommendations made in our previous report as well as to provide further recommendations to improve IAQ. Appendix A shows recommendations from the 2017 reports. In addition, the LHS complex will be undergoing significant renovations over the next several years. Recommendations included in this report will also address planning for renovation-related issues.

Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

IAQ Testing Results

Table 1 includes indoor air testing results, which are summarized below.

- ***Carbon dioxide levels*** were above the MDPH guideline of 800 parts per million (ppm) in more than a third of all areas assessed including all occupied classrooms, indicating a lack of air exchange in those areas of the building. Appendix B is an additional resource about carbon dioxide.
- ***Temperature*** was within or close to the recommended range of 70°F to 78°F in areas tested the day of assessment.
- ***Relative humidity*** was within or close to the lower end of the recommended range of 40 to 60% in the areas tested.
- ***Carbon monoxide*** levels were non-detectable in the areas tested.
- ***Fine particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality (NAAQS) limit of 35 $\mu g/m^3$ in all but four areas tested. This is discussed further in the "Other Conditions" section of the report.

Ventilation

A heating, ventilating, and air conditioning (HVAC) system has several functions. First it provides heating and, if equipped, cooling. Second, it is a source of fresh air. Finally, an HVAC system will dilute and remove normally occurring indoor environmental pollutants by not only introducing fresh air, but by filtering the airstream and ejecting stale air to the outdoors via exhaust ventilation. Even if an HVAC system is operating as designed, point sources of respiratory irritation may exist and cause symptoms in sensitive individuals.

Fresh air is provided by multiple air-handling units (AHUs) located on the roof. These units vary in size, age, and condition. According to building facility staff, several of the units have been replaced since the 2017 visits. In general, AHUs draw fresh air through an intake vent, where the air is filtered, then heated or cooled (i.e., conditioned). The conditioned fresh air is mixed with some air returned from rooms, then supplied to rooms through supply diffusers/grates throughout the building (Pictures 1 and 2). Return vents in rooms (Picture 3) bring stale air back to the AHU where a portion of this air is exhausted through louvers in the AHU. In the basement area, some classrooms were equipped with separate AHUs/fan coil units mounted in the ceiling.

In the oldest parts of the school, remnants of the original ventilation system still exist, including the gravity exhaust vents at the base of classroom walls (Picture 4). It was not known if these vents were still connected to ductwork or to any vents on the roof. If they do not function, they should be sealed up in an airtight manner, as they could provide pathways for dust, odors and pests to travel in the building.

Based on air sampling, many classrooms with normal occupancy appeared to have a lack of air exchange provided by the HVAC system in its current operating mode. Given the age and operation of the existing HVAC system, it may be necessary to open windows during temperate weather to supplement fresh air supply for classrooms.

The HVAC systems should be regularly maintained and operate continuously during occupied hours. It may be possible to adjust AHUs to allow more fresh air into the system, e.g. by opening supply louvers or adjusting the proportion of air exhausted rather than recirculated. Exhaust ventilation should also be checked periodically to ensure a draw of air from classrooms.

It was noted that the cooking area in the basement (Room 17) lacked exhaust ventilation, which is particularly important in areas where pollutants would be generated. Levels of particulate matter were elevated in this area (Table 1) and there was an odor of cooking. In addition, at least one of the stoves uses natural gas, which can create nitrous oxides and other products of combustion.

In order to have proper ventilation with a mechanical supply and exhaust system, these systems must be balanced to provide an adequate amount of fresh air while removing stale air from a room. It is recommended that existing ventilation systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994). It is unknown the last time these systems were balanced.

Microbial/Moisture Concerns

As noted in previous reports, the building was constructed with materials that, for the most part, are not susceptible to mold growth. The majority of these building sections consist of brick, concrete, tile, plaster, and glass; none of which contain carbon and are resistant to mold growth, even with chronic moistening. Hardwood is also highly resistant to microbial growth. Hardwood was observed throughout these sections in flooring, support beams, and trim.

Building renovations that occurred in later years added porous building materials such as carpeting, ceiling tiles, and gypsum wallboard. These materials contain carbon, which can support mold/microbial growth.

Carpeting is a material that can become water-damaged and colonized with mold. The MDPH/IAQ program does not recommend the use of carpeting in schools, particularly in lower levels, due to the likelihood of it becoming moistened due to spills, tracked in moisture and condensation. During the previous visits to LHS, musty odors were noted in many classrooms with carpeting found in poor condition/beyond its service life. Much of the older carpeting has been removed from the building since the 2017 visit (Table 1). Due to the construction of the flooring in this part of the school complex, which is plywood, new carpet tiles were installed rather than non-porous flooring.

Some old carpeting remains in the building, including some that is visibly stained, wrinkled, or threadbare (Picture 5; Table 1), indicating it is past its service life. The service life of carpeting in schools is approximately 10-11 years (IICRC, 2002). Aging carpet can produce fibers that can be irritating to the respiratory system. In addition, tears or lifting carpet can create tripping hazards. Carpeting should be cleaned annually or semi-annually in soiled high traffic areas as per the recommendations of the Institute of Inspection, Cleaning, and Restoration Certification (IICRC, 2012).

Water-damaged ceiling tiles, plaster, gypsum wallboard and flooring were observed in classrooms, offices, hallways and closets (Pictures 6 through 10; Table 1). Damage to these materials indicates leaks from the building envelope or HVAC/plumbing system. Ceiling tiles and gypsum wallboard should be replaced after a leak is found and repaired. In general, ceiling tiles have an open space above them (the ceiling plenum) and tend to dry out quickly, reducing the chance that they will be colonized with mold. Building facility staff reported that the 1920s building roof has been replaced since the last visit, so most of the observed water-damaged ceiling tiles are from historic leaks. However, a recent leak was reported in room 351. Replacement of all water-damaged ceiling tiles is planned as funds for new materials becomes available.

Measures should be taken to ensure water-damaged materials are cleaned, replaced, and/or repaired in a manner consistent with the U.S. Environmental Protection Agency's guidelines (US EPA, 2008). The US EPA and the American Conference of Governmental

Industrial Hygienists (ACGIH) recommend that porous materials (e.g., ceiling tiles, gypsum wallboard) be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2008; ACGIH, 1989). If not dried within this time frame they should be removed/discarded.

In many areas, some ceiling tiles were also missing (Picture 7; Table 1). These need to be replaced to maintain a continuous ceiling plenum and prevent dust and debris from above the ceiling tiles entering occupied areas.

Water-damaged plaster, efflorescence and peeling paint was observed in a number of areas (Pictures 8 and 9; Table 1). Efflorescence is a characteristic sign of water damage to building materials such as brick, mortar, or plaster, but it is not mold growth. As moisture penetrates and works its way through mortar around brick, water-soluble compounds dissolve, creating a solution. As the solution moves to the surface of the brick or mortar, water evaporates, leaving behind white, powdery mineral deposits. This condition indicates that water from the exterior has penetrated into the building. When present, efflorescence can be readily cleaned.

A severely water-damaged floor was observed in the closet of room 105A (Picture 10). The wooden floor was springy/spongy underfoot and could serve as a safety hazard. This area should be locked/off limits until repairs can be made.

Some areas in the building are equipped with air conditioning from the AHUs. Doors between these areas and non-air-conditioned areas should be kept closed to prevent condensation of humid air on chilled surfaces. A few other areas were equipped with portable or window air conditioners (Picture 11). It is important that these units have the ability to properly drain any condensation they generate so that it does not leak and moisten building materials.

Windows are openable in most exterior classrooms. Open windows can be an additional source of fresh air. However, windows need to be tightly closed at the end of each day to prevent water infiltration and pest intrusion. Windows should not be opened in a room where air conditioning is operating.

Refrigerators were found in some classrooms and offices (Picture 12; Table 1). Refrigerators should be kept clean and free of spills and spoiled food. Refrigerators and water dispensers should not be placed in carpeted areas where spills or leaks could moisten carpeting (e.g., Picture 5).

There are sinks in some classrooms, some of which appear not to be used. There may also be unused floor drains. The trap seals in unused drains can dry out and allow sewer gas and

odors into occupied areas. Seldom used drains should be wetted periodically to maintain the trap seal. Some science rooms had safety showers, which should be monitored and maintained to prevent leaks. No porous materials should be stored under or near the safety showers.

Plants were noted in a few areas, including some in carpeted areas and in poor condition (Picture 13). Plants should be well maintained, placed on non-porous drip pans, and kept away from the airstream of ventilation equipment.

Ivy was observed growing on the exterior of the building (Picture 14). Ivy can damage masonry and also holds moisture against the building, preventing it from drying and increasing the potential for water damage.

Other Conditions

Exposure to low levels of volatile organic compounds (VOCs) may produce eye, nose, throat, and/or respiratory irritation in some sensitive individuals. BEH/IAQ staff examined spaces for products containing VOCs, noting cleaning products, air fresheners, hand sanitizers and dry erase materials in a number of areas throughout the space (Picture 15; Table 1). All of these products have the potential to be irritants to the eyes, nose, throat, and respiratory system of sensitive individuals. Other sources of total volatile organic compounds (TVOCs) include copy machines and laminators. Excess heat, odors, VOCs and ozone can be produced by photocopiers, particularly if the equipment is older and in frequent use. Ozone is a respiratory irritant (Schmidt Etkin, 1992). Laminators produce TVOCs and plastic odors. This equipment should be used in well-ventilated areas away from occupants.

As mentioned previously, Room 17 had an unvented stove which was observed to produce elevated particulate matter with a diameter of 2.5 micrometers (μm) or less (PM2.5). In addition, the hallway outside of the network hub room on the second floor had elevated PM2.5 levels. No source of combustion could be located in this area, however MDPH/IAQ staff did note that this hallway had old, worn carpeting. It is possible that the carpeting could produce fine particulates with high foot traffic, especially if it is not regularly vacuumed. Fragrance diffusers, humidifiers, and candles can also produce elevated PM2.5 and should be eliminated from the building. Elevated PM2.5 levels can produce immediate, irritant effects upon exposure.

In many areas, items, including books, papers, and decorative items were observed on floors, windowsills, tabletops, counters, bookcases, and desks, which can make it more difficult

for custodial staff to clean (Table 1). Many classrooms had personal fans and some of these had dusty blades. Many supply and exhaust vents were also observed to be dusty (Picture 3; Table 1). Dust on ventilation and fan equipment can be aerosolized when the units are activated.

Conclusions/Recommendations

The following recommendations are made to assist in improving IAQ:

1. Consult Appendix A for previous recommendations that need additional work.
2. Limit access to storage closet in room 105A, until floor repairs are made.
3. Operate supply and exhaust ventilation continuously during occupied hours. Adjust ventilation equipment (e.g. louvers, flow rates) where possible to increase fresh air, particularly to frequently used classrooms.
4. Do not block supply or exhaust vents with furniture or items. Check exhaust/return vents periodically for proper function. Where exhaust vents are switch-operated, ensure they are turned on when the room is occupied.
5. Use openable windows to supplement fresh air during temperate weather. Ensure all windows are tightly closed at the end of the day. Inform occupants that windows should not be opened while the HVAC system is in cooling mode to avoid condensation.
6. Ensure areas which generate pollutants, such as cooking areas, have operable exhaust functioning.
7. Assess the status of existing old gravity exhaust vents and seal as needed.
8. Ensure that a system of regular “Operations and Maintenance” remains in place to keep HVAC systems in proper working order.
9. Consider adopting a balancing schedule of every 5 years for all mechanical ventilation systems, as recommended by ventilation industrial standards (SMACNA, 1994).
10. Replace remaining water-damaged ceiling tiles and monitor for new leaks (e.g., room 351). Prioritize replacement of ceiling tiles with potential mold staining and in frequently-occupied areas.
11. Remove remaining water-damaged, musty, or worn carpeting. Replace with non-porous materials if possible.
12. Repair water-damaged plaster; scrape off/vacuum peeling paint and efflorescence (e.g., Pictures 8 and 9).

13. Repair/replace any other water-damaged/mold-colonized porous building materials (e.g., gypsum wallboard) in classrooms, hallways and stairwell areas.
14. Ensure water-damaged materials are cleaned, replaced, and/or repaired in a manner consistent with the U.S. Environmental Protection Agency's guidelines (US EPA, 2008).
15. Replace any missing or ajar ceiling tiles to avoid pathways to unconditioned areas.
16. Regularly inspect window and portable air conditioning units to ensure proper drainage of condensate and regular cleaning of filters.
17. Ensure that doors are closed between areas with air conditioning and areas without air conditioning, to avoid condensation of humid air on chilled surfaces.
18. Refrain from storing porous items (e.g., boxes, books, paper, clothing) directly on flooring, in below grade spaces, under sink cabinets and near safety showers to avoid microbial colonization.
19. Avoid placing refrigerators and water dispensers on carpet.
20. Clean refrigerators frequently to prevent spills and odors.
21. Trim back trees/vegetation within 5′ of the building. Remove vegetation (e.g., ivy) that is growing on the building to avoid damage to exterior from associated moisture.
22. Reduce the use of products containing fragrances and VOCs.
23. Locate photocopiers and laminators in well ventilated areas away from occupants.
24. Ensure Material Safety Sheets are available for all laboratory, maintenance and janitorial chemicals used in the building.
25. Regularly clean supply/return vents and fans to avoid aerosolizing accumulated particulate matter.
26. Consider reducing the amount of items stored in classrooms to make cleaning easier. Periodically move items to clean flat surfaces.
27. Clean any remaining carpeting and area rugs annually or more often in high-traffic locations in accordance with IICRC recommendations (IICRC, 2012) and discard those that are worn out or too soiled to be cleaned.
28. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. To control for dusts, a high efficiency particulate arrestance

(HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended. Avoid the use of feather dusters. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).

29. Encourage faculty to report classroom/building related issues via a tracking program.
30. As construction on this building is planned and commences, use the guidance "Methods Used to Reduce/Prevent Exposure to Construction/Renovation Generated Pollutants in Occupied Buildings" which is included as Appendix C.
31. Continue to adopt the US EPA (2000) document, "Tools for Schools", as an instrument for maintaining a good IAQ environment in the building available at: http://www.epa.gov/iaq/schools/index.html.
32. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

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Picture 1

Supply duct and vent in a classroom without suspended ceiling tile system

Picture 2

Supply vent in suspended ceiling tile system

Picture 3

Return vent, note dust and debris on grill

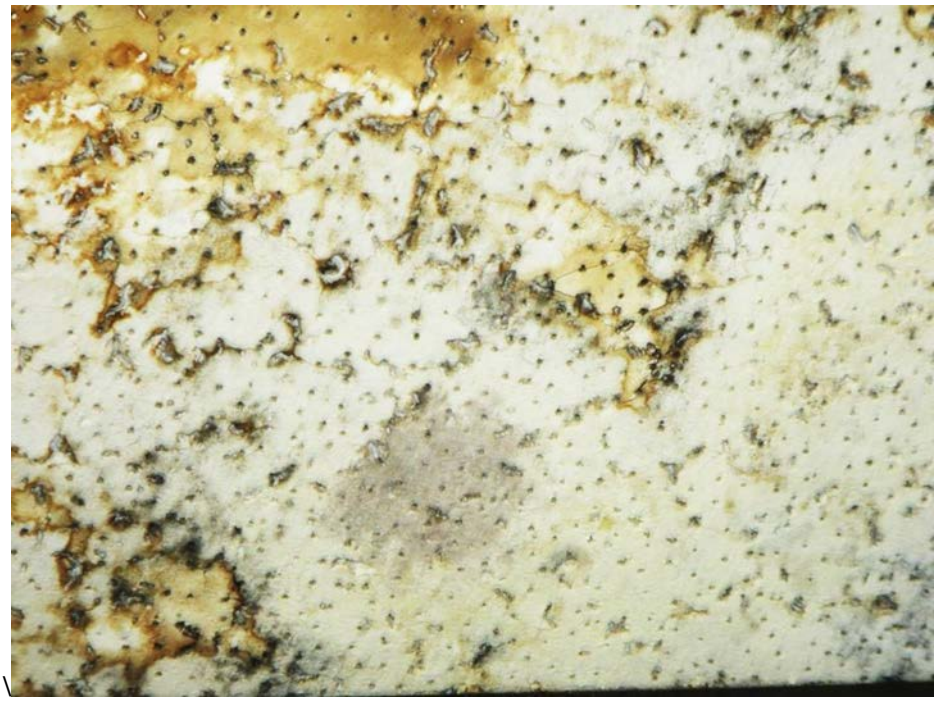
Picture 4

Old gravity exhaust vent

Picture 5

Worn, stained carpeting in a hallway, note water fountain over carpet

Picture 6



Water-damaged ceiling tile with dark staining that may indicate mold

Picture 7

Water-damaged ceiling tiles and missing tile

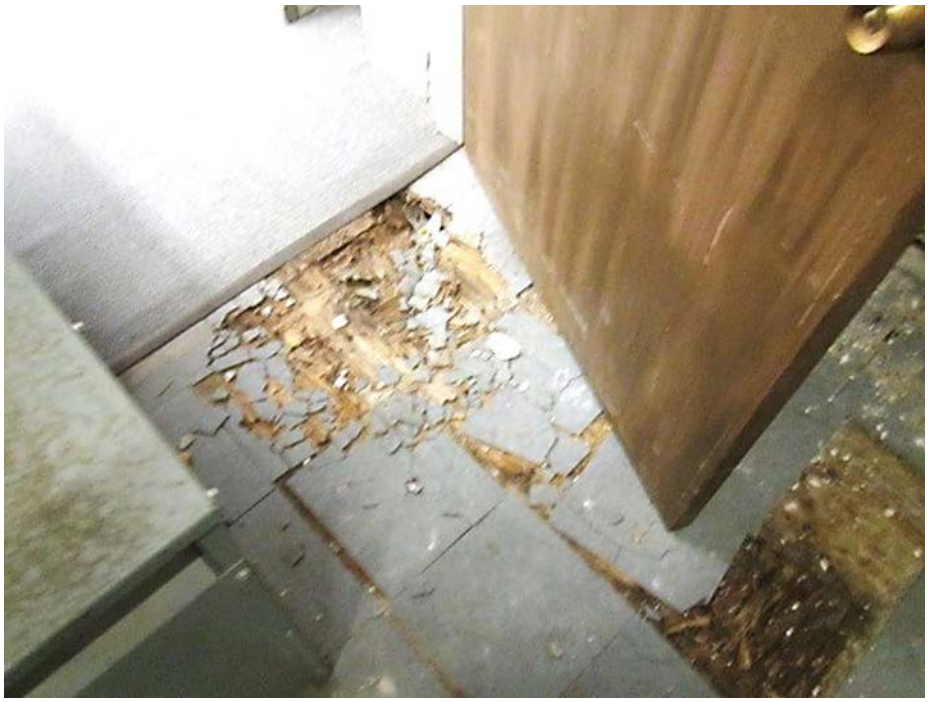
Picture 8

Water-damaged ceiling plaster

Picture 9

Water-damaged plaster, peeling paint and efflorescence in closet of room 101

Picture 10



Severely damaged floor due to water leak in closet of room 105A

Picture 11

Portable air conditioner

Picture 12

Small refrigerator on carpet

Picture 13

Plant in a carpeted area, plant was in poor condition

Picture 14

Ivy growing on the side of the building

Picture 15

Cleaning products and hand sanitizer

Location: Lowell High School 1920s building **Indoor Air Results**

Address: 14 French Street, Lowell **Table 1** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Background (outside)	422	ND	59	52	12	-	-	-	-	
Third Floor										
Book room	750	ND	70	41	8	0	N	Y	Y	MT, books, some on floor
Food prep area	628	ND	71	40	7	0	Y	Y	Y	Fridges and microwave, fridge has spill
Guidance A-L	758	ND	73		9	1	Y	Y	Y	DEM, WD CT and cracked plaster
House Dean	766	ND	73	39	8	2	Y	Y	Y	WAC, carpet
Office	660	ND	71	38	8	0	N	Y	Y	Old carpet, food, PF
Open area	682	ND	71	40	7	1	Y	Y	Y	Old carpet
Open area with round tables	591	ND	71	39	7	0	Y 1 open	Y	N	Old carpet – worn, vending machines
Teachers' center										Old carpet

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Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

Location: Lowell High School 1920s building **Indoor Air Results**

Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Upper section office	577	ND	72	37	5	0	N	Y	Y	NC, AI
Upper section, Department Head office	635	ND	71	44	5	1	N	Y	Y	Fridge on carpet, old carpet
Upper section, office with round windows	597	ND	71	38	5	0	N	Y	Y	Dusty vents, CP, missing floor tiles
Workroom	624	ND	70	38	5	0	Y	Y	Y	New carpet, DEM
301 area office	766	ND	73	38	9	1	Y	Y	Y	WD CT (small), water cooler on carpet
301 E	776	ND	72	39	9	1	Y	Y	Y	PF, new carpet (2 years)
304A	757	ND	72	41	7	0	Y	Y	Y	NC, chalk, plants, soil, sinks
304A Closet										WD CT and MT, peeling paint
305A	749	ND	72	38	10	1 class just left	Y 1 open	Y	Y	New carpet, DEM

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Location: Lowell High School 1920s building **Indoor Air Results**

Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
305C	642	ND	70	38	8	0	Y	Y	Y	New carpet, PF, food, CP, fridge
306 conference	651	ND	71	39	8	0	Y	Y	Y	New carpet
308	946	ND	70	47	10	3	Y	Y	Y	New carpet, WD CT, HS, PF
308 inner room	895	ND	70	44	12	0	Y	Y	Y	Dusty exhaust vents, carpet, fridge on carpet, microwave
309	782	ND	70	41	12	6	Y	Y	Y	Copy machine, new carpet, DEM
309 inner	655	ND	70	39	8	0	N	Y	Y	WD CT, boxes on floor
310	1020	ND	72	42	10	25	Y	Y	Y	Tile floor, open doors, DEM, chalk, HS
311	1130	ND	72	44	10	30 left recently	Y	Y	Y	Wood floor, DEM, old unit
312	807	ND	71	39	9	17	Y 1 open	Y	Y	Computer, old carpet, DEM
313	1159	ND	73	43	11	20	Y	Y	Y	Wood floor, DEM, sink (may be unused)

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Location: Lowell High School 1920s building **Indoor Air Results**

Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
314	662	ND	73	37	8	1	Y (maybe)	Y	Y	Science room, gas spigots, NC, PS, safety shower
315	1234	ND	73	43	11	2 plus class left	Y	Y	Y	Wood floor, DEM, PF
316	1046	ND	73	41	12	12	Y 1 open	Y	Y	Old carpet, DEM, chalk, WD CT
317										Closet
318	1073	ND	72	41	13	0	Y	Y	Y	Wood floor, WD CT, chalk, DEM
319	820	ND	74	39	10	0	Y	Y	Y	DEM, wood floor
320	938	ND	73	41	11	0 class left earlier	Y	Y	Y	New carpet, DEM
321	1119	ND	74	45	12	4	Y	Y	Y	Tile and wood flooring, dusty vent, DEM
323	798	ND	74	38	10	0	Y	Y	Y	New carpet, UF, PF
323 inner	719	ND	74	37	27	0	Y	Y	Y	WAC, fridge

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Location: Lowell High School 1920s building **Indoor Air Results**

Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
324	727	ND	72	38	9	15 just left	Y	Y	Y	Older carpet – good condition, DEM, PF, AI, studio arts room
325	1031	ND	74	40	9	16	Y	Y	Y	Wood floor, DEM
326	863	ND	72	39	11	1	Y	Y	Y	HS, new carpet
330	1208	ND	72	43	18	15	Y	Y	Y	New carpet, DEM, chalk
331	798	ND	73	38	9	17	Y	Y	Y	DEM
333	920	ND	74	40	10	17	Y	Y	Y	Wood floor, PF, DEM
334	850	ND	71	40	10	15	Y	Y	Y	New carpet, DEM
338	738	ND	72	38	15	14	Y	Y	Y	Wood floor, DEM, 2 WD CT
346	691	ND	73	38	10	1	Y 1 open	Y	Y	Older carpet – stains, DEM, PF
348	824	ND	73	38	28	17	Y 1 open	Y	Y	New carpet, DEM, 2 WD CT

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Location: Lowell High School 1920s building **Indoor Air Results**

Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
349	629	ND	75	37	8	4	Y	Y	Y	Old carpet
351	686	ND	74	36	10	13	Y 1 open	Y	Y	New carpet, WD CT (reportedly new leak), DEM
352	891	ND	73	42	36	15	Y 1 open	Y	Y	New carpet, DEM
392	1095	ND	74	40	9	15	Y	Y	Y	Wood floor, DEM, PF
Second Floor										
Mrs. Tortie	690	ND	72	45	7	0	N	Y	Y	Plants, area rug and carpet
Faculty men's room	-	-	-	-	-	-	-	-	Y off	WD ceiling
Hallway near network hub	-	-	-	-	77-111	-	-	-	-	Old carpet, high particulates
202	984	ND	71	43	10	22	Y	Y	Y	Old carpet, DEM, dusty exhaust vent
203	867	ND	72	42	13	22	Y	Y	Y	DEM, old carpet

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Location: Lowell High School 1920s building **Indoor Air Results**

Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
204 A	542	ND	71	38	8	0	Y a few open	Y	Y	DEM, plant, area rug, carpet
206 A	880	ND	72	41	9	1	N	Y	Y	Carpet
206 A	712	ND	72	39	8	0	N	Y	Y	PF, carpet
206 Computer	711	ND	72	39	9	0	Y	Y	Y	Ivy outside window, carpet
207A	738	ND	71	40	9	5	Y	Y	Y	Carpet
207B	806	ND	71	41	9	0	Y	Y	Y	Carpet, several years old, DEM, dusty vents
208 A	813	ND	71	41	7	4	Y	Y	Y	Clothes
209A	987	ND	72	40	9	0	N	Y	Y	5 year old carpet, microwave
209C	744	ND	71	40	10	0	N	Y	Y	DEM
209	653	ND	70	39	9	1	Y 1 open	Y	Y	5 year old carpet, HS, DEM

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Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
210	1080	ND	70	51	18	26	Y	N	N	Old carpet, plants, radiators
212A	630	ND	68	44	18	26	Y open	N	N	Carpet
213	982	ND	72	44	13	19	Y open	N	N	Newer carpet, DEM, HS, plants
214A	778	ND	72	42	16	0	Y	N	N	Wood floor, PF, DEM, HS
214	-	-	-	-	-	-	-	-	-	Locked/unoccupied, old carpet
215	-	-	-	-	-	-	-	-	-	Locked/unoccupied, wood floor
216	987	ND	68	49	16	22	Y open	N	N	DEM, wood floor
217	787	ND	73	41	14	0	Y open	N	N	Newer carpet (reported: no hardwood under), Portable AC, DEM, plants, PF, HS
218	1142	ND	71	49	14	0	Y	Y off	N	Wood floor, DEM
219	1228	ND	74	44	15	20	Y	N	N	CPs, wood floor

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Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
220C	749	ND	70	44	15	5	Y	N	N	Carpet
223	1107	ND	73	43	16	20	Y	Y off	N	DEM, wood floor, HS
224	898	ND	72	43	16	15	Y open	N	N	Old carpet, DEM, allergy complaints
227	1321	ND	74	46	16	24	Y	N	N	DEM, wood floor
229	963	ND	73	43	17	9	Y	N	N	Carpet, DEM
231	979	ND	73	42	14	15 leaving	Y	N	N	DEM, hardwood floor, PF
235	773	ND	73	40	13	10	Y open	N	N	HS, wood floor, DEM, plants
237	-	-	-	-	-	-	-	-	-	Locked/unoccupied, hardwood, computer lab
239	566	ND	72	40	14	1	Y	Y off	Y off	HS
249	1183	ND	74	45	17	50	Y	Y off	N	Hosting large presentation, reports of mice, AHU inactive due to leaks/loud noise, carpet

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								Supply	Exhaust	
251	994	ND	74	42	39	0	Y	Y off	Y off	Old carpet, HS, mini fridge, DEM
254	689	ND	71	43	14	0	Y	Y	Y	Old carpet, DEM
First Floor										
Auditorium	680	ND	73	38	7	~50	N	Y	Y	Some carpet
101	782	ND	71	42	8	21	Y	Y	Y	3 WD CT, WD plaster in closet, DO
102	852	ND	73	40	5	20	Y	Y	Y	Carpet, DO
104	890	ND	73	41	6	25	Y	Y	Y	Carpet, DO
105A	751	ND	71	43	8	20	Y	Y	Y	WD wall plaster (former leak), WD wooden floor in closet (potential tripping/safety hazard)
106A	551	ND	74	38	4	0	Y	Y	Y	Carpet, AC, WD windowsill
107	555	ND	70	39	7	24	Y	Y	Y	Carpet

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Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
109	947	ND	72	43	8	24	Y	Y	Y	Carpet
110	778	ND	71	42	7	16	Y	Y	Y	
112	515	ND	71	39	5	0	Y	Y	Y	Carpet
113	584	ND	70	41	6	7	Y Open	Y	Y	Carpet
114	926	ND	72	43	8	6	Y	Y	Y	
115	1159	ND	72	45	8	17	Y Open	Y	Y	DO
116	702	ND	71	41	9	2	Y	Y	Y	Carpet, DO
117	613	ND	70	40	9	12	Y Open	Y	Y	Carpet
118	812	ND	72	43	8	6	Y	Y	Y	DO
119	1048	ND	70	40	8	18	Y Open	Y	Y	

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								Supply	Exhaust	
120	658	ND	72	40	7	6	Y	Y	Y	Carpet, DO
120C	545	ND	71	39	7	0	Y	Y	Y	Carpet
120F	573	ND	70	41	8	1	N	Y Door	Y	Exhaust not drawing, PF, DO
120G	634	ND	70	41	8	0	N	Y Door	N	
121	635	ND	70	41	7	0	Y	Y	Y	Old/soiled carpet, small fridge, toaster, microwave
122	959	ND	72	43	8	5	Y	Y	Y	Carpet
123	874	ND	70	39	8	19	Y	Y	Y	PF
125	1065	ND	71	46	8	6	Y	Y	Y	
126B	773	ND	73	40	7	1	Y	Y	Y	
128	875	ND	72	41	8	13	Y	Y	Y	DO

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								Supply	Exhaust	
131	541	ND	71	39	7	0	Y Open	Y	Y	Old/worn carpet, PF, HS, AF
132	909	ND	73	42	8	22	Y	Y	Y	DO
133	663	ND	70	41	9	23	Y Open	Y	Y	Carpet, DO
134	564	ND	72	45	8	3	Y	Y	Y	
135 Stage	768	ND	73	40	8	10	N	Y	Y	
136	858	ND	74	42	7	21	Y	Y	Y	
137	768	ND	71	41	7	7	Y	Y	Y	DO
139	755	ND	73	41	9	17	Y Open	Y	Y	Carpet, DO
142	679	ND	70	39	9	22	Y	Y	Y	Carpet stain, 3 WD CTs
144	515	ND	73	37	9	4	Y	Y	Y	MT, WD CT, DO

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Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
145	620	ND	73	38	7	14	Y	Y	Y	Cracked window, carpet, MT, 4 WD CT
147	905	ND	73	43	8	23	Y	Y	Y	2 windows inoperable, DO, carpet, plants, PF-dusty, WD CT
Basement										
001	966	ND	71	46	6	28	Y	Y	Y	1 MT, 1 WD CT
002	916	ND	71	46	8	0	Y	Y	Y	
003	567	ND	70	40	4	4	Y	Y	Y	3 MT, 1 WD CT
005	659	ND	70	44	8	6	N	Y	Y	
007	672	ND	72	41	9	1	N	Y	Y	Carpet
008	693	ND	71	44	8	0	Y	Y	Y	
009	635	ND	71	43	17	5	N	Y	Y	Restaurant

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Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
009 kitchen	651	ND	72	49	25	30+	N	Y	Y	
012	765	ND	70	47	8	8	Y	Y	Y	8 WD CT
013	683	ND	71	41	5	0	Y	Y	Y	1 WD CT
014	597	ND	69	45	5	2	Y	Y	Y	Carpet
015	613	ND	71	41	3	0	N	Y	Y	
016	713	ND	70	46	7	11	N	Y	Y	
017	1148	ND	73	53	175	13	Y	Y	Y	Cooking, stoves, no exhaust, 1 stove gas-fired
018	723	ND	72	48	2	1	N	Y	Y	
019	910	ND	72	49	16	0	Y	Y	Y	Cooking odors
020	766	ND	72	45	5	5	Y	Y	Y	Tennis balls as glides

ppm = parts per million
µg/m^3 = micrograms per cubic meter
ND = non detect
AC = air conditioner
AF = air freshener
AHU = air handling unit
AI = accumulated items
CP = cleaning products
CT = ceiling tile
DEM = dry erase materials
DO = door open
HS = hand sanitizer
MT = missing CT
NC = not carpeted
PF = personal fan
UF = upholstered furniture
WAC = window air conditioner
WD = water-damaged

Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferable
> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

Location: Lowell High School 1920s building **Indoor Air Results**

Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
021	1020	ND	71	48	5	4	Y	Y	Y	Carpet
022	782	ND	72	43	6	2	Y	Y	Y	
024	657	ND	73	42	13	0	Y	Y	Y	Ajar CT, carpet
028	536	ND	72	41	4	0	Y	Y	Y	Carpet, 3 WD CT
029	900	ND	73	44	12	50+	Y	Y	Y	Carpet
030	596	ND	72	42	7	0	Y	Y	Y	Carpet
037	513	ND	70	44	6	0	Y	Y	Y	Carpet
039	838	ND	72	46	15	22	Y	Y	Y	Carpet
Band meeting room	531	ND	73	39	6	3	Y	Y	Y	
ROTC	693	ND	71	44	9	2	Y	Y	Y	7 WD CT

ppm = parts per million
µg/m^3 = micrograms per cubic meter
ND = non detect
AC = air conditioner
AF = air freshener
AHU = air handling unit
AI = accumulated items
CP = cleaning products
CT = ceiling tile
DEM = dry erase materials
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Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferable
> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

Location: Lowell High School 1920s building **Indoor Air Results**

Address: 14 French Street, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Storage	682	ND	72	44	22	0	N	Y	Y	5 ajar CT

ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter
ND = non detect
AC = air conditioner
AF = air freshener
AHU = air handling unit
AI = accumulated items
CP = cleaning products
CT = ceiling tile
DEM = dry erase materials
DO = door open
HS = hand sanitizer
MT = missing CT
NC = not carpeted
PF = personal fan
UF = upholstered furniture
WAC = window air conditioner
WD = water-damaged

Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferable
> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

APPENDIX A
Previous Recommendations

Conclusions/Recommendations from the visit made in July of 2017

The following recommendations are made to assist in improving IAQ:

33. Remove any water-damaged, musty, or worn carpeting. Alternative floor coverings should be explored for below grade areas as carpeting is not recommended.
34. Replace any water-damaged/mold-colonized porous building materials (e.g., ceiling tiles, gypsum wallboard) in classrooms, hallways and stairwell areas. Ensure water-damaged materials are cleaned, replaced, and/or repaired in a manner consistent with the U.S. Environmental Protection Agency's guidelines (US EPA, 2008).
35. Consult with an HVAC contractor to thoroughly examine all HVAC system components to ensure proper function. Make any necessary repairs to ensure the system is working as designed.
36. Ensure that a system of regular "Operations and Maintenance" remains in place to keep HVAC systems in proper working order.
37. Operate all supply and exhaust ventilation equipment continuously during occupied periods. Do not block supply or exhaust vents with furniture or items.
38. Consult with a roofing contractor to assess the roof membrane and underlayment/decking system. Repairs should be made to stop leaks and chronic water damage to building materials. The roofing system should then be monitored regularly for water pooling, leaks, and other deteriorating conditions.
39. Roof drains should be inspected regularly to remove any debris to avoid clogging/pooling.
40. Exterior HVAC ductwork should be inspected to find any missing or damaged insulation or unintended gaps which may allow moisture or pests to be introduced into the ductwork. Perform any necessary repairs. This would also include adding the "candy cane" vent covers to the exhaust louvres open to the elements.
41. Inspect and repair/replace any fresh air intakes that have missing or damaged bird screens or pre-filters.

42. Consult with a building engineer to inspect the building envelope to address any areas of water intrusion (e.g., windows, brickwork/mortar, flashing). This would include the brickwork noted with efflorescence and the spalling parapet.
43. Use openable windows to supplement fresh air during temperate weather. Ensure all windows are tightly closed at the end of the day. Inform occupants that windows should not be opened while the HVAC system is in cooling mode to avoid condensation.
44. Replace any missing or ajar ceiling tiles to avoid pathways to unconditioned areas.
45. Consider adopting a balancing schedule of every 5 years for all mechanical ventilation systems, as recommended by ventilation industrial standards (SMACNA, 1994).
46. Ensure any plumbing leaks are repaired to avoid chronic water damage in the building.
47. Repair sinks and sink backsplashes in classrooms.
48. Regularly add water to any fixtures/drains that are out of order or are rarely used to avoid dry drain traps. Make necessary repairs or if fixtures are deemed unnecessary they should be properly abandoned and capped.
49. Ensure that condensation from AHU equipment is draining properly. Check collector pans, piping and any associated pumps for clogs and leaks and clean periodically to prevent stagnant water build-up and remove debris that may provide a medium for microbial growth.
50. Regularly inspect window and portable air conditioning units to ensure proper drainage of condensate and regular cleaning of filters.
51. Ensure that doors are closed between areas with air conditioning and areas without air conditioning, to avoid condensation of humid air on chilled surfaces.
52. Refrain from storing porous items (e.g., boxes, books, paper, clothing) directly on flooring, in below grade spaces, or under sink cabinets to avoid microbial colonization.
53. Trim back trees/vegetation within 5′ of the building. Remove any vegetation (e.g., ivy) that is growing on the building to avoid damage to exterior from associated moisture.
54. Consider utilizing MERV 8 filters in AHUs. Check with manufacturer's recommendations before changing filter efficiency. Continue to change filters 2-4 times a year.
55. Regularly clean supply/return vents and fans to avoid aerosolizing accumulated particulate matter.

56. Clean any remaining carpeting and area rugs annually or more often in high-traffic locations in accordance with IICRC recommendations (IICRC, 2012) and discard those that are worn out or too soiled to be cleaned.
57. Replace/repair fluorescent light covers; ensure fluorescent lights are fully secured to prevent breakage and clean debris out of covers.
58. Encourage faculty to report classroom/building related issues via a tracking program.
59. Continue to adopt the US EPA (2000) document, "Tools for Schools", as an instrument for maintaining a good IAQ environment in the building available at: http://www.epa.gov/iaq/schools/index.html.
60. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

Conclusions/Recommendations from the visit made in December of 2017

1. For information regarding the roof and recommendations, please refer to the August 2017 IAQ assessment.
2. Remove any water-damaged, musty, or worn carpeting and replace with non-porous flooring in classrooms and below-grade areas.
3. Use openable windows to supplement fresh air during temperate weather. Ensure all windows are tightly closed at the end of the day. Inform occupants that windows should not be opened while the HVAC system is in cooling mode to avoid condensation.
4. Consult with an HVAC contractor to thoroughly examine all HVAC system components to ensure proper function. Make any necessary repairs to ensure the system is working as designed. Assess whether adjustments can be made to allow more fresh air into the system.
5. Operate all supply and exhaust ventilation equipment continuously during occupied periods. Do not block supply or exhaust vents with furniture or items. Check exhaust/return vents periodically for proper function. Where exhaust vents are switch-operated, ensure they are turned on when the room is occupied.

6. Ensure areas which generate pollutants, such as cooking class areas, have operable exhaust functioning.
7. Ensure that a system of regular "Operations and Maintenance" remains in place to keep HVAC systems in proper working order.
8. Consider adopting a balancing schedule of every 5 years for all mechanical ventilation systems, as recommended by ventilation industrial standards (SMACNA, 1994).
9. Repair water leaks in Room 105A. Repair plaster once water leak once repaired.
10. Replace any water-damaged/mold-colonized porous building materials (e.g., ceiling tiles, gypsum wallboard) in classrooms, hallways and stairwell areas. Ensure water-damaged materials are cleaned, replaced, and/or repaired in a manner consistent with the U.S. Environmental Protection Agency's guidelines (US EPA, 2008).
11. Replace any missing or ajar ceiling tiles to avoid pathways to unconditioned areas.
12. Ensure that a system of regular "Operations and Maintenance" remains in place to keep HVAC systems in proper working order.
13. Ensure pipe leak in room 113 is repaired.
14. Regularly inspect window and portable air conditioning units to ensure proper drainage of condensate and regular cleaning of filters.
15. Ensure that doors are closed between areas with air conditioning and areas without air conditioning, to avoid condensation of humid air on chilled surfaces.
16. Refrain from storing porous items (e.g., boxes, books, paper, clothing) directly on flooring, in below grade spaces, or under sink cabinets to avoid microbial colonization.
17. Trim back trees/vegetation within 5′ of the building. Remove any vegetation (e.g., ivy) that is growing on the building to avoid damage to exterior from associated moisture.
18. Reduce the use of products containing VOCs.
19. Locate photocopiers and laminators in well ventilated areas away from occupants.
20. Ensure Material Safety Sheets are available for all laboratory, maintenance and janitorial chemicals used in the building.
21. Regularly clean supply/return vents and fans to avoid aerosolizing accumulated particulate matter.
22. Consider reducing the amount of items stored in classrooms to make cleaning easier. Periodically move items to clean flat surfaces.

23. Clean any remaining carpeting and area rugs annually or more often in high-traffic locations in accordance with IICRC recommendations (IICRC, 2012) and discard those that are worn out or too soiled to be cleaned.
24. Encourage faculty to report classroom/building related issues via a tracking program.
25. Continue to adopt the US EPA (2000) document, "Tools for Schools", as an instrument for maintaining a good IAQ environment in the building available at: http://www.epa.gov/iaq/schools/index.html.
26. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

Appendix B

Carbon Dioxide and its Use in Evaluating Adequacy of Ventilation in Buildings

The Bureau of Environmental Health's (BEH) Indoor Air Quality (IAQ) Program examines indoor air quality conditions that may have an effect on building occupants. The status of the ventilation system, potential moisture problems/microbial growth and identification of respiratory irritants are examined in detail, which are described in the attached report. In order to examine the function of the ventilation system, measurements for carbon dioxide, temperature and relative humidity are taken. Carbon dioxide measurements are commonly used to assess the adequacy of ventilation within an indoor environment.

Carbon dioxide is an odorless, colorless gas. It is found naturally in the environment and is produced in the respiration process of living beings. Another source of carbon dioxide is the burning of fossil fuels. Carbon dioxide concentration in the atmosphere is approximately 250-600 ppm (Beard, 1982; NIOSH, 1987).

Carbon dioxide measurements within an occupied building are a standard method used to gauge the adequacy of ventilation systems. Carbon dioxide is used in this process for a number of reasons. Any occupied building will have normally occurring environmental pollutants in its interior. Human beings produce waste heat, moisture and carbon dioxide as by-products of the respiration process. Equipment, plants, cleaning products or supplies normally found in any building can produce gases, vapors, fumes or dusts when in use. If a building has an adequately operating mechanical ventilation system, these normally occurring environmental pollutants will be diluted and removed from the interior of the building. The introduction of fresh air both increases the comfort of the occupants and serves to dilute normally occurring environmental pollutants.

An operating exhaust ventilation system physically removes air from a room and thereby removes environmental pollutants. The operation of supply in conjunction with the exhaust ventilation system creates airflow through a room, which increases the comfort of the occupants. If all or part of the ventilation system becomes non-functional, a build up of normally occurring environmental pollutants may occur, resulting in an increase in the discomfort of occupants.

The MDPH approach to resolving indoor air quality problems in schools and public buildings is generally two-fold: 1) improving ventilation to dilute and remove environmental pollutants and 2) reducing or eliminating exposure opportunities from materials that may be adversely affecting indoor air quality. In the case of an odor complaint of unknown origin, it is common for BEH staff to receive several descriptions from building occupants. A description of odor is subjective, based on the individual's life experiences and perception. Rather than test for a potential series of thousands of chemicals to identify the unknown material, carbon dioxide is used to judge the adequacy of airflow as it both dilutes and removes indoor air environmental pollutants.

As previously mentioned, carbon dioxide is used as a diagnostic tool to evaluate air exchange by building ventilation systems. The presence of increased levels of carbon dioxide in indoor air of buildings is attributed to occupancy. As individuals breathe, carbon dioxide is exhaled. The greater the number of occupants, the greater the amount of carbon dioxide produced. Carbon dioxide concentration build up in indoor environments is attributed to inefficient or non-functioning ventilation systems. The Occupational Safety and Health Administration (OSHA) standard for carbon dioxide is 5,000 parts per million parts of air (ppm). Workers may be exposed to this level for 40 hours/week, based on a time-weighted average (OSHA, 1997).

Carbon dioxide can be a hazard within enclosed areas with **no air supply**. These types of enclosed areas are known as confined spaces. Manholes, mines and sewer systems are examples of confined spaces. An ordinary building is not considered a confined space. Carbon dioxide air exposure limits for employees and the general public have been established by a number of governmental health and industrial safety groups. Each of these standards of air concentrations is expressed in parts per million (ppm). *Table 1* is a listing of carbon dioxide air concentrations and related health effects and standards.

The MDPH uses a guideline of 800 ppm for publicly occupied buildings (Burge et al., 1990; Gold, 1992; Norback, 1990; OSHA, 1994; Redlich, 1997; Rosenstock, 1996; SMACNA, 1998). A guideline of 600 ppm or less is preferred in schools due to the fact that the majority of occupants are young and considered to be a more sensitive population in the evaluation of environmental health status. Several sources indicate that indoor air problems *are significantly reduced* at 600 ppm or less of carbon dioxide (ACGIH, 1998; Bright et al., 1992; Hill, 1992; NIOSH, 1987). Inadequate ventilation and/or elevated temperatures are major causes of complaints such as respiratory, eye, nose and throat irritation, lethargy and headaches.

Air levels for carbon dioxide that indicate that indoor air quality may be a problem have been established by the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE). Above 1,000 ppm of carbon dioxide, ASHRAE recommends adjustment of the building's ventilation system (ASHRAE, 1989). In 2001, ASHRAE modified their standard to indicate that no more than 700 ppm above the outdoor air concentration; however 800 ppm is the level where further investigation will occur.

Carbon dioxide itself has no acute (short-term) health effects associated with low level exposure (below 5,000 ppm). The main effect of carbon dioxide involves its ability to displace

oxygen for the air in a confined space. As oxygen is inhaled, carbon dioxide levels build up in the confined space, with a decrease in oxygen content in the available air. This displacement of oxygen makes carbon dioxide a simple asphyxiant. At carbon dioxide levels of 30,000 ppm, severe headaches, diffuse sweating, and labored breathing have been reported. No **chronic** health effects are reported at air levels below 5,000 ppm.

Air testing is one method used to determine whether carbon dioxide levels exceed the comfort levels recommended. If carbon dioxide levels are over 800-1,000 ppm, the MDPH recommends adjustment of the building's ventilation system. The MDPH recommends that corrective measures be taken at levels above 800 ppm of carbon dioxide in office buildings or schools. (Please note that carbon dioxide levels measured below 800 ppm may not decrease indoor air quality complaints). Sources of environmental pollutants indoors can often induce symptoms in exposed individuals regardless of the adequacy of the ventilation system. As an example, an idling bus outside a building may have minimal effect on carbon dioxide levels, but can be a source of carbon monoxide, particulates and odors via the ventilation system.

Therefore, the MDPH strategy of adequate ventilation coupled with pollutant source reduction/removal serves to improve indoor air quality in a building. Please note that each table included in the IAQ assessment lists BEH comfort levels for carbon dioxide levels at the bottom (i.e. carbon dioxide levels between 600 ppm to 800 ppm are acceptable and <600 ppm is preferable). While carbon dioxide levels are important, focusing on these air measurements in isolation to all other recommendations is a misinterpretation of the recommendations made in these assessments.

Table 1: Carbon Dioxide Air Level Standards

Carbon Dioxide Level	Health Effects	Standards or Use of Concentration	Reference
250-600 ppm	None	Concentrations in ambient air	Beard, R.R., 1982 NIOSH, 1987
600 ppm	None	Few indoor air complaints, used as reference for air exchange for protection of children	ACGIH, 1998; Bright et al., 1992; Hill, 1992; NIOSH 1987
800 ppm	None	Used as an indicator of ventilation adequacy in schools and public buildings, used as reference for air exchange for protection of children	Mendler, 2003 Bell, A. A., 2000; NCOSP, 1998; SMACNA, 1998; EA, 1997; Redlich, 1997; Rosenstock, 1996; OSHA, 1994; Gold, 1992; Burge et al., 1990; Norback, 1990 ; IDPH, Unknown
1000 ppm	None	Used as an indicator of ventilation inadequacy concerning removal of odors from the interior of building.	ASHRAE, 1989
950-1300 ppm*	None	Used as an indicator of ventilation inadequacy concerning removal of odors from the interior of building.	ASHRAE, 1999
700 ppm (over background)	None	Used as an indicator of ventilation inadequacy concerning removal of odors from the interior of building.	ASHRAE, 2001
5000 ppm	No acute (short term) or chronic (long-term) health effects	Permissible Exposure Limit/Threshold Limit Value	ACGIH, 1999 OSHA, 1997
30,000 ppm	Severe headaches, diffuse sweating, and labored breathing	Short-term Exposure Limit	ACGIH, 1999 ACGIH. 1986

* outdoor carbon dioxide measurement +700 ppm

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Appendix C

Commonwealth of Massachusetts
Department of Public Health
Helping People Lead Healthy Lives In Healthy Communities

BUREAU OF ENVIRONMENTAL HEALTH

Indoor Air Quality Program

Methods Used to Reduce/Prevent Exposure to Construction/Renovation Generated Pollutants in Occupied Buildings

November 2006

Among the most serious indoor air quality health issues is the potential exposure to construction/renovation-generated pollutants in occupied buildings. The renovation of occupied buildings provides a number of potential exposure opportunities to pollutants. Demolition of the building materials can provide exposure to mold, asbestos, lead, bird waste and other respiratory irritants. The application of tile adhesive, roofing materials, paints and other products used during renovations provide point sources of volatile organic compounds (VOCs) and other irritating chemicals. Contractors frequently use fossil fueled construction and heating equipment in indoor areas undergoing renovations. Combustion products (e.g. carbon monoxide) can migrate into occupied areas. The impact of construction/renovation pollutants on occupied areas can be evaluated through air monitoring for VOCs, airborne particles and products of combustion. Preventing and/or minimizing exposure to construction/renovation-generated pollutants is essential to reduce indoor air-related symptoms in building occupants.

In 1999, the State Department of Education (DOE) amended their regulations to require that state funded construction projects follow established guidelines to prevent exposure of building occupants to construction/renovation pollutants. Subsequently, Chapter 208 of the Acts of 2004 transferred responsibility for the School Building Assistance Program from the DOE to the Massachusetts School Building Authority (MSBA). On September 6, 2006, the MSBA enacted regulations that require that schools receiving funds under the program for construction or renovation projects must confer with the most current edition of the "IAQ Guidelines for Occupied Buildings Under Construction" published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) 963 CMR 2.04(2)(c),(d).

The MDPH has prepared this guidance in order to prevent/reduce the migration of renovation-generated pollutants into occupied areas and their potential impact on indoor air quality. The MDPH suggests that the following steps be taken on any renovation project within a public building.

Physical Isolation of Occupied Areas from Renovation Areas

Renovations of buildings should be separated from occupied areas by constructing temporary

physical barriers. These barriers are typically constructed of plywood and polyethylene plastic built in or over passageways between the construction area and the occupied spaces. Construction barriers should be sealed with polyethylene plastic and duct tape on the construction side as well as the occupied side to provide a duel barrier. Inspection of these barriers should be conducted daily prior to commencement of construction activities to ensure integrity. A log of the location and condition of each barrier should be maintained in a log book.

Other migratory pathways for pollutants to move between construction and occupied areas should be examined and sealed. These migratory pathways may include but are not limited to:

- Crawlspaces
- Electrical outlets and light switches in shared walls
- Pipe and electrical conduits between walls
- Ventilation system ductwork
- Holes in interior walls and/or spaces above interior walls and roof/floor decking (e.g., spaces above ceiling tile systems).

Outdoor construction-generated pollutants can migrate indoors under various conditions. The following are recommendations to reduce migration of *outdoor* pollutants to the indoor environment:

- Seal around exterior doors with weather stripping and door sweeps to prevent infiltration of outdoor construction-generated pollutants.
- Cover with tarps any dirt/debris piles in close proximity to the building or wet down dirt/debris to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.
- Temporarily deactivate the HVAC system during construction generating high amounts of outdoor pollutants. If activity is longer than one day, alternative means of ventilation should be provided for the impacted areas. If not feasible, relocation of activities in these areas should be considered.

The Use of Pressurization/Depressurization Techniques

Construction sites should be isolated and depressurized compared with occupied areas to control for renovation pollutants. To achieve depressurization, use fans to draw air away from occupied areas. Use of the existing supply ventilation system to introduce fresh outside air into occupied space should be used to increase air pressure in occupied areas adjacent to construction activities. In order to assess whether depressurization has occurred, air pressure monitoring (using a micromanometer) to measure air pressure differential between occupied space and construction areas should be used. Monitoring should be done daily at each barrier to ensure appropriate pressurization. Results of the

location, dates and results of air pressure monitoring should be kept in a log book. No construction work should occur in areas immediately adjacent to occupied areas if:

- Depressurization is not achieved,
- Air pressure monitoring has not been done that day, or
- Odor/construction related complaints have been made by occupants in adjacent areas.

Operation of the Existing Ventilation Systems

Precautions should be taken to avoid the *re-entrainment* of construction-related materials into the building's HVAC system. The design of each system must be assessed to determine how it may be impacted by renovation activities and contingency plans to maintain adequate supply of fresh air and temperature must also be developed and implemented to maintain building occupant safety and comfort. Specific HVAC protection requirements pertain to the return, central filtration and supply components of the ventilation system. This may entail shutting down systems (when possible) during periods of heavy construction and demolition, ensuring systems are isolated from contaminated environments, sealing ventilation openings with plastic and using filters with a higher dust spot efficiency where needed.

Administrative Management to Prevent Exposure to Construction Generated Pollutants

Various administrative actions can also prevent occupant exposures to construction/renovation-generated pollutants. The following measures should be used to prevent, eliminate or reduce occupant exposure to construction-generated pollutants:

- Schedule projects that produce large amounts of dusts, odors and emissions during unoccupied periods or periods of low occupancy.
- Develop a notification system for building occupants to report construction/renovation related odors and/or dust problems to the building administrator. These concerns should be relayed to the contractor in a manner to allow for a timely remediation of the problem.
- Disseminate scheduling itinerary to all affected parties; this can be done in the form of meetings, newsletters or weekly bulletins.
- Notify occupants about construction activities that may be conducted in close proximity to their work areas. In certain cases, HVAC equipment for areas adjacent to construction activities may need to be deactivated and windows closed periodically to prevent unfiltered air and vehicle exhaust from entering the building. For this reason, prior notification(s) should be made.
- If possible, relocate susceptible persons and those with pre-existing medical conditions (e.g., hypersensitivity, asthma) away from areas of renovations.
- Keep Material Safety Data Sheets (MSDS) for all construction materials used during renovations in an area that is accessible to all individuals during periods of building operations as required by the Massachusetts Right-To-Know Act.

Appendix C

Control/Reduction of Pollutants in Occupied Areas

Frequently, renovations include the replacement of components of the HVAC system, rendering windows as the only source of fresh air. In this environment, removal of normally occurring pollutants as well as construction-generated pollutants must be enhanced to reduce exposure.

The following recommendations are made to reduce exposure under these circumstances:

- Implement prudent housekeeping and work site practices to minimize exposure to renovation pollutants. This should include daily cleaning of occupied areas during the course of renovation work generating dust, fumes and other particulate materials.
- Consider increasing the number of personnel or work hours for existing staff (e.g., before school) to provide increased cleaning of dirt/dust accumulation in occupied areas due to construction/renovation activities.
- Control for dusts by using a high efficiency particulate air filter (HEPA) equipped vacuum cleaner in conjunction with wet wiping/mopping of all surfaces.
- Cover with tarps any dirt/debris piles (indoors and outdoors) in close proximity to the building or wet down dirt/debris (outdoors) to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.

Inspection upon Request

The Massachusetts Department of Public Health, Bureau of Environmental Health, Indoor Air Quality Program, is available to inspect a public building upon receipt of a written request for inspection from and in cooperation with the appropriate government agency.

QUESTIONS

If you have any questions concerning these guidelines, please contact:

Massachusetts Department of Public Health
Bureau of Environmental Health, Indoor Air Quality Program
250 Washington Street, 7th Floor
Boston, MA 02108
Phone: (617) 624-5757 Fax: (617) 624-5777

Document Reviewed: August 2008

City of Lowell Department of Public Works
1365 Middlesex Street • Lowell, MA 01852
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Christine Clancy, P.E.
DPW Commissioner

BOH
1/8/2020
HANDOUT

TO: The Board of Health

FROM: Christine Clancy, P.E., DPW Commissioner

DATE: January 8, 2020

RE: Status Summary of Lowell High School Indoor Air Quality Reassessment Reports

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The City has received the indoor air quality assessment reports dated December 2019 for the Lowell High School 1922 and 1980 buildings. These indoor air quality assessments were conducted as a follow up to an assessment completed in 2017.

As having just started as the DPW Commissioner of Public Works on January 4, 2020, I am prioritizing the review of these documents. The DPW will be conducting a walkthrough of the two buildings this week to review the report results and recommendations. DPW and the Schools Department will then meet to develop an action plan and response to these reports. A more detailed response to these reports will be provided at the next Board of Health Meeting

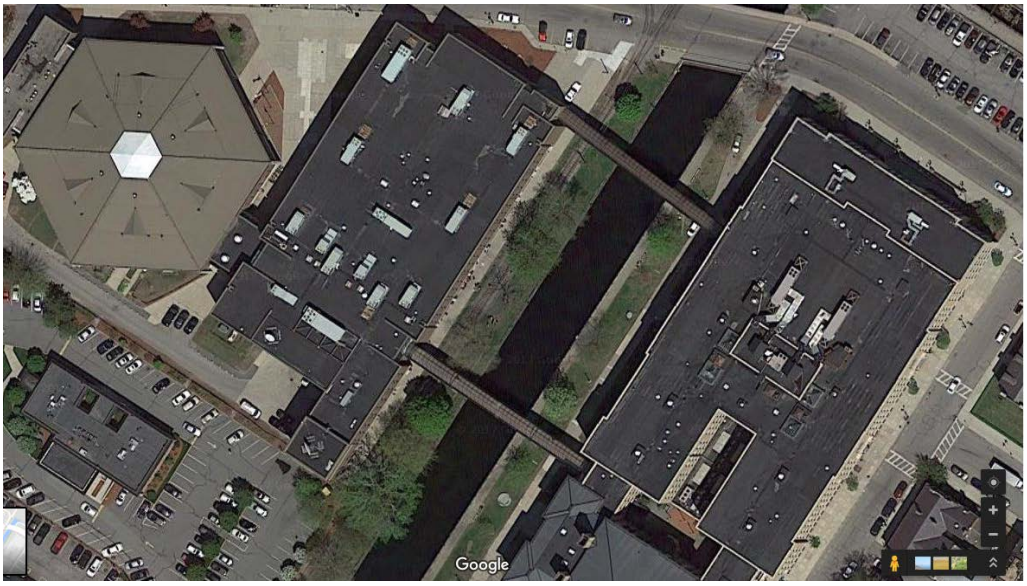
Thank you

Cc: Jim Hall, School Department
Kara Keefe Mullin, Assistant City Manager
JoAnn Keegan, Interim Director, Health and Human Services

BOH HANDOUT 1/8/20
APPENDIX B & C ADDED

INDOOR AIR QUALITY REASSESSMENT

Lowell High School
"1980 Building"
50 Father Morissette Boulevard
Lowell, MA



Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
December 2019

Background

Building:	Lowell High School (LHS) "1980s" building
Address:	50 Father Morissette Boulevard, Lowell, MA
Assessment Coordinated Through:	Lowell Public Schools
Reason for Request:	Reassessment based on actions taken since the previous visit in 2017.
Date of Assessment:	October 25, 2019
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Jason Dustin, Environmental Analyst' Cory Holmes, Environmental Analyst, Ruth Alfasso, Environmental Engineer, and Mike Feeney Director, Indoor Air Quality Program (IAQ)
Building Description:	The building at 50 Father Morissette Boulevard is a brick and concrete complex constructed in 1980. It has an attached fieldhouse containing gymnasiums, locker rooms, and a pool, which is now closed. This building is connected to the building at 14 French Street by several enclosed walkways.
Windows:	Openable

This school was visited previously in 2017. Two visits were made: one during the summer when the school was unoccupied and again in the fall during normal occupancy. Recommendations were made in a report following each visit. The MDPH/IAQ Program returned to the school this year for a follow-up visit, in part to assess the response to recommendations made in our previous report as well as to provide further recommendations to improve IAQ. Appendix A shows recommendations from both 2017 reports. In addition, the LHS complex will be undergoing significant renovations over the next several years. Recommendations included in this report will also address planning for renovation-related issues.

Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

IAQ Testing Results

Table 1 includes indoor air testing results, which are summarized below.

- ***Carbon dioxide levels*** were above the MDPH guideline of 800 parts per million (ppm) in about half of all areas assessed, indicating a lack of air exchange in those areas of the building. Appendix B is an additional resource about carbon dioxide.
- ***Temperature*** was within the recommended range of 70°F to 78°F in all areas the day of assessment.
- ***Relative humidity*** was within or close to the lower end of the recommended range of 40 to 60% in the areas tested.
- ***Carbon monoxide*** levels were non-detectable (ND) in the areas tested.
- ***Fine particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality (NAAQS) limit of 35 $\mu g/m^3$ in all areas tested.

Ventilation

A heating, ventilating, and air conditioning (HVAC) system has several functions. First it provides heating and, if equipped, cooling. Second, it is a source of fresh air. Finally, an HVAC system will dilute and remove normally occurring indoor environmental pollutants by not only introducing fresh air, but by filtering the airstream and ejecting stale air to the outdoors via exhaust ventilation. Even if an HVAC system is operating as designed, point sources of respiratory irritation may exist and cause symptoms in sensitive individuals.

Fresh air is provided by multiple air-handling units (AHUs) located on the roof. The AHUs are mostly “packaged” units that provide both heat and air conditioning (AC). Fresh air intakes draw in fresh air through an intake vent where it is filtered, then heated or cooled. The conditioned fresh air is mixed with some air returned from classrooms, then supplied to rooms through supply diffusers/grates throughout the building (Picture 1). Return vents (Picture 2) bring stale air back to the AHUs where a portion of this air is exhausted through louvers. The HVAC systems should be regularly maintained and operate continuously during occupied hours.

Based on air sampling, many classrooms with normal occupancy appeared to have a lack of air exchange provided by the HVAC system in its current operating mode. Given the age and operation of the existing HVAC system, it may be necessary to use openable windows to supplement fresh air supply for classrooms. It may be possible to adjust AHUs to allow more

fresh air into the system, e.g. by opening supply louvers or adjusting the proportion of air exhausted rather than recirculated. Exhaust ventilation should also be checked periodically to ensure a draw of air from classrooms. In addition, no air circulation was detected in the Nurse's suite from either the supply or return/exhaust vents. This area is entirely dependent on mechanical ventilation for it has no windows.

In order to have proper ventilation with a mechanical supply and exhaust system, these systems must be balanced to provide an adequate amount of fresh air while removing stale air from a room. It is recommended that existing ventilation systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994). It is unknown the last time these systems were balanced.

Microbial/Moisture Concerns

Water-damaged ceiling tiles and plaster walls were observed in many classrooms, offices, and hallways (Picture 1, 3 and 4; Table 1), indicating leaks from the building envelope or plumbing system. The roof of the 1980s building has not undergone any significant repair/replacement since the previous IAQ visit in 2017, so roof leaks account for the majority of stained ceiling tiles. In addition, occupants report active leaks in some areas.

Ceiling tiles should be replaced after the leak is found and repaired. In general, ceiling tiles have an open space above them (the ceiling plenum) and tend to dry out quickly, reducing the chance for mold colonization. Ceiling plaster does not contain organic material; therefore, it will not support microbial growth even when frequently moistened. In some cases, dust or paint on the surface of plaster can become mold colonized. If this occurs, plaster can often be cleaned to remove the mold.

In many areas, ceiling tiles were also missing (Picture 5; Table 1). These need to be replaced to maintain a continuous ceiling plenum and prevent dust and debris from above the ceiling tiles entering occupied areas.

Carpeting is a material that can become water-damaged and colonized with mold. The BEH/IAQ Program does not recommend the use of carpeting in schools, particularly in ground floor or basement levels, due to the likelihood of it becoming moistened due to spills, tracked in moisture, and condensation. During the previous visits to LHS, musty odors were noted in many classrooms with carpeting, and carpeting in the building was mostly found to be beyond its

service life and in poor condition. Much of the older carpeting has been removed from the building since the 2017 visit (Table 1).

Some old carpeting remains in the building including some that is visibly stained, wrinkled, or threadbare (Table 1), indicating it was past its service life. The service life of carpeting in schools is approximately 10-11 years (IICRC, 2002). Aging carpet can produce fibers that can be irritating to the respiratory system. In addition, tears or lifting carpet can create tripping hazards. Carpeting should be cleaned annually or semi-annually in soiled high traffic areas as per the recommendations of the Institute of Inspection, Cleaning, and Restoration Certification (IICRC, 2012).

Measures should be taken to ensure water-damaged materials are cleaned, replaced, and/or repaired in a manner consistent with the U.S. Environmental Protection Agency's guidelines (US EPA, 2008). The US EPA and the American Conference of Governmental Industrial Hygienists (ACGIH) recommend that porous materials (e.g., ceiling tiles, gypsum wallboard) be dried with fans and heating within 24 to 48 hours of becoming wet (US EPA, 2008; ACGIH, 1989). If not dried within this time frame they should be removed/discarded.

Some areas in the buildings are equipped with AC from the AHUs. Doors between these areas and non-air-conditioned areas should be kept closed to prevent condensation of humid air on chilled surfaces. Windows should also not be opened in a room while AC is operating. This can lead to condensation on surfaces chilled by air conditioning which can moisten building materials.

Windows are openable in most exterior classrooms. Open windows can be an additional source of fresh air. However, windows need to be tightly closed at the end of each day to prevent water infiltration and pest intrusion. A window was found closed around ivy, which prevents a tight seal (Picture 6). In addition, ivy and other plants should be removed from in and adjacent to the exterior of the building as plants can hold water against the exterior and lead to building envelope deterioration. They can also be a source of pollen and odors through open windows.

Refrigerators and microwaves were found in some classrooms and offices (Table 1), which should be kept clean and free of spills and spoiled food (Picture 7). Refrigerators and water dispensers should not be placed in carpeted areas where spills or leaks could moisten carpeting.

There are sinks in some classrooms (and other areas; Table 1), some of which appear not to be used. There may also be unused floor drains. The trap seals in unused drains can dry out and allow sewer gas and odors into occupied areas. Seldom used drains should be wetted periodically to maintain the trap seal. Some science rooms had safety showers, which should be monitored and maintained to prevent leaks. No porous materials should be stored under or near the safety showers.

Other Conditions

Exposure to low levels of volatile organic compounds (VOCs) may produce eye, nose, throat, and/or respiratory irritation in some sensitive individuals. BEH/IAQ staff examined spaces for products containing VOCs, noting cleaning products, air fresheners, hand sanitizers and dry erase materials in a number of areas throughout the space (Table 1). All of these products have the potential to be irritants to the eyes, nose, throat, and respiratory system of sensitive individuals. Other sources of total volatile organic compounds (TVOCs) include copy machines and laminators. Excess heat, odors, VOCs and ozone can be produced by photocopiers, particularly if the equipment is older and in frequent use. Ozone is a respiratory irritant (Schmidt Etkin, 1992). Laminators produce TVOCs and plastic odors. This equipment should be used in well-ventilated areas away from occupants.

Some occupants reported problems with mice in occupied areas. Mouse urine is a known sensitizer/allergen having irritant effects upon some occupants.

In many areas, items, including books, papers, and decorative items were observed on floors, windowsills, tabletops, counters, bookcases, and desks, which can make it more difficult for custodial staff to clean (Table 1). Many classrooms had personal fans and some of these had dusty blades. Many supply and exhaust vents were also observed to be dusty (Picture 2; Table 1). Dust on ventilation and fan equipment can be aerosolized when the units are activated.

Conclusions/Recommendations

The following recommendations are made to assist in improving IAQ:

1. Consult A for previous recommendations that need additional work.

2. Operate supply and exhaust ventilation continuously during occupied hours. Adjust ventilation equipment (e.g. louvers, flow rates) where possible to increase fresh air, particularly to frequently used classrooms.
3. Do not block supply or exhaust vents with furniture or items. Check exhaust/return vents periodically for proper function. Where exhaust vents are switch-operated, ensure they are turned on when the room is occupied.
4. Ensure mechanical ventilation to the Nurse's suite is functional/operating; make repairs as needed.
5. Use openable windows to supplement fresh air during temperate weather. Ensure all windows are tightly closed at the end of the day. Inform occupants that windows should not be opened while the HVAC system is in cooling mode to avoid condensation.
6. Ensure areas which generate pollutants, such as cooking class areas, have operable exhaust functioning.
7. Ensure that a system of regular "Operations and Maintenance" remains in place to keep HVAC systems in proper working order.
8. Consider adopting a balancing schedule of every 5 years for all mechanical ventilation systems, as recommended by ventilation industrial standards (SMACNA, 1994).
9. Replace remaining water-damaged ceiling tiles and monitor for new leaks (e.g., room 617). Prioritize replacement of ceiling tiles with potential mold staining and in frequently-occupied areas.
10. Remove remaining water-damaged, musty, or worn carpeting. Replace with non-porous materials if possible.
11. Repair water-damaged plaster.
12. Repair/replace any other water-damaged/mold-colonized porous building materials (e.g., gypsum wallboard) in classrooms, hallways and stairwell areas.
13. Ensure water-damaged materials are cleaned, replaced, and/or repaired in a manner consistent with the U.S. Environmental Protection Agency's guidelines (US EPA, 2008).
14. Replace any missing or ajar ceiling tiles to avoid pathways to unconditioned areas.
15. Regularly inspect window and portable air conditioning units to ensure proper drainage of condensate and regular cleaning of filters.

16. Ensure that doors are closed between areas with air conditioning and areas without air conditioning, to avoid condensation of humid air on chilled surfaces.
17. Refrain from storing porous items (e.g., boxes, books, paper, clothing) directly on flooring, in below grade spaces, under sink cabinets and near safety showers to avoid microbial colonization.
18. Ensure unused or seldom used drains are wetted periodically to maintain the trap seal.
19. Avoid placing refrigerators and water dispensers on carpet.
20. Clean refrigerators frequently to prevent spills and odors.
21. Trim back trees/vegetation within 5′ of the building. Remove vegetation (e.g., ivy) that is growing on the building to avoid damage to exterior from associated moisture.
22. Reduce the use of products containing fragrances and VOCs.
23. Locate photocopiers and laminators in well ventilated areas away from occupants.
24. Ensure Material Safety Sheets are available for all laboratory, maintenance and janitorial chemicals used in the building.
25. Contract with a pest control company to regularly inspect and control mice in occupied areas. Keep food in secure containers and seal any pathways that may allow rodent entry to the building. Thoroughly clean areas where mice have been observed to remove mouse dander and urine which are common allergens.
26. Regularly clean supply/return vents and fans to avoid aerosolizing accumulated particulate matter.
27. Consider reducing the amount of items stored in classrooms to make cleaning easier. Periodically move items to clean flat surfaces.
28. Clean any remaining carpeting and area rugs annually or more often in high-traffic locations in accordance with IICRC recommendations (IICRC, 2012) and discard those that are worn out or too soiled to be cleaned.
29. Encourage faculty to report classroom/building related issues via a tracking program.
30. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. To control for dusts, a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is

recommended. Avoid the use of feather dusters. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).

31. As construction on this building is planned and commences, use the guidance "Methods Used to Reduce/Prevent Exposure to Construction/Renovation Generated Pollutants in Occupied Buildings" which is included as Appendix C.
32. Continue to adopt the US EPA (2000) document, "Tools for Schools", as an instrument for maintaining a good IAQ environment in the building available at: http://www.epa.gov/iaq/schools/index.html.
33. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

References

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US EPA. 2008. "Mold Remediation in Schools and Commercial Buildings". Office of Air and Radiation, Indoor Environments Division, Washington, DC. EPA 402-K-01-001. September 2008. Available at: http://www.epa.gov/mold/mold-remediation-schools-and-commercial-buildings-guide.

Picture 1

Supply vent (arrow) and water-damaged ceiling tiles

Picture 2

Return/exhaust vent, note dust on vent

Picture 3

Water-damaged ceiling tiles

Picture 4

Water-damaged ceiling tiles

Picture 5

Missing ceiling tiles

Picture 6

Ivy coming in window

Picture 7

Microwave with food spill

Location: Lowell High School 1980 building **Indoor Air Results**

Address: 50 Father Morisette Blvd, Lowell **Table 1** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Background (outside)	422	ND	59	52	12	-	-	-	-	
Third Floor										
Mr. O'Keefe	1000	ND	74	44	14	1	N	Y	Y	DEM, NC
Hosmer office	906	ND	76	41	11	1	N	Y	Y	NC
Quinton office	943	ND	74	41	11	1	N	Y	Y	NC, fridge
Consultant's office	852	ND	74	40	12	0	N	Y	Y	NC
Plant room	760	ND	76	38	12	1	N	N	Y	PC, WD CT, floor drain, sink (currently used as an office)
Hallway next to plant room	-	-	-	-	-	-	-	-	-	WD CTs, MTs
610A	957	ND	74	39	12	1	N	Y	Y	HS, WD, DEM, computers

ppm = parts per million	AF = air freshener	CT = ceiling tile	HS = hand sanitizer	PC = photocopier
$\mu g/m^3$ = micrograms per cubic meter	AI = accumulated items	DEM = dry erase materials	MT = missing CT	PF = personal fan
ND = non detect	CP = cleaning products	GW = gypsum wallboard	NC = not carpeted	WD = water-damaged

Comfort Guidelines

Carbon Dioxide:	< 800 ppm = preferable	Temperature:	70 - 78 °F
	> 800 ppm = indicative of ventilation problems	Relative Humidity:	40 - 60%

Location: Lowell High School 1980 building **Indoor Air Results**

Address: 50 Father Morisette Blvd, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
610B	746	ND	73	39	11	1	N	Y	Y	Carpet, DEM
612	1810	ND	74	48	14	25	N	Y	Y	HS, WD
613	1328	ND	74	44	14	30 gone 20 minute	N	Y	Y	Active WD CTs
614	1107	ND	73	44	12	26	N	Y	Y	DEM, HS
615	1027	ND	73	44	12	1	N	Y	Y	WD CTs, DEM
616	941	ND	72	42	12	25	N	Y	Y	MT, WD CT
617	1126	ND	73	43	7	15	Y	Y	Y	NC, WD CT and MT, reports of leaks “raining inside”, DEM
619	1227	ND	73	47	10	26	N	Y	Y	
620	1232	ND	75	42	10	0	N	Y	Y	NC, DEM, PF

ppm = parts per million	AF = air freshener	CT = ceiling tile	HS = hand sanitizer	PC = photocopier
$\mu g/m^3$ = micrograms per cubic meter	AI = accumulated items	DEM = dry erase materials	MT = missing CT	PF = personal fan
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Location: Lowell High School 1980 building **Indoor Air Results**

Address: 50 Father Morisette Blvd, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
622C	770	ND	75	39	9	11	N	Y	Y	4 MT, WD CT, dusty vents and adjacent CT, DEM, NC
623	1223	ND	75	41	9	30	N	Y	Y	NC, DEM, 4 WD CT
624	1028	ND	75	39	8	0	N	Y	Y	DEM, loud vent, dusty vents and dusty CT
624 science lab	1088	ND	75	40	8	0	N	Y	Y	Science sinks, one drips, AI, fridge and microwave
625	978	ND	74	39	8	1	N	Y	Y	DEM, CP
625 science lab	1008	ND	75	39	9	16	N	Y	Y	Science class in progress, DEM, dusty vents, auxiliary exhaust in lab – on
625 Science prep room									Y	Chemical storage in cabinets and shelves
626	849	ND	74	38	8	25	N	Y	Y	4 WD CT
626 lab	808	ND	74	37	7	3	N	Y	Y	Sink, dusty vents, CP, WD CT

ppm = parts per million	AF = air freshener	CT = ceiling tile	HS = hand sanitizer	PC = photocopier
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ND = non detect	CP = cleaning products	GW = gypsum wallboard	NC = not carpeted	WD = water-damaged

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Location: Lowell High School 1980 building **Indoor Air Results**

Address: 50 Father Morisette Blvd, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
628 computers	899	ND	73	37	7	0	N	Y	Y	Many WD CT, NC, computers
629 computers	772	ND	73	37	7	30	N	Y	Y	NC, DEM, computers
630	714	ND	75	37	9	0	N	Y	Y	NC, DEM, PF – dusty
640	967	ND	73	42	11	1	N	Y	Y	PF on
642	853	ND	74	40	10	0	N	Y	Y	AF odor (plug-in), NC, DEM
643	1015	ND	74	43	9	25	N	Y	Y	NC, DEM, dusty vents
644	907	ND	73	40	8	1	N	Y	Y	NC, DEM, HS
645	1187	ND	74	46	8	25	N	Y	Y	NC, dusty vents, DEM
646 A	832	ND	73	40	7	11	N	Y	Y	NC, WD CT, dusty vents

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µg/m^3 = micrograms per cubic meter	AI = accumulated items	DEM = dry erase materials	MT = missing CT	PF = personal fan
ND = non detect	CP = cleaning products	GW = gypsum wallboard	NC = not carpeted	WD = water-damaged

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Location: Lowell High School 1980 building **Indoor Air Results**

Address: 50 Father Morisette Blvd, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
652	607	ND	71	40	8	1	Y 1 open	Y	Y	NC, DEM, dusty vents, WD CT
653	838	ND	71	42	6	16	Y	Y	Y	DEM, NC
654	754	ND	71	43	10	2	N	Y	Y	DEM, HS
655	868	ND	72	42	7	25	Y	Y	Y	DEM, chalk, NC
656	947	ND	72	44	11	28	N	Y	Y	DEM
657	790	ND	72	41	8	18	Y 3 open	Y	Y	NC, DEM, chalk
658	830	ND	72	43	9	1	N	Y	Y	DEM, WD CT
Second Floor										
Little Theater	499	ND	72	37	7	0	N	Y	Y	Carpet

ppm = parts per million
µg/m^3 = micrograms per cubic meter
ND = non detect
AF = air freshener
AI = accumulated items
CP = cleaning products
CT = ceiling tile
DEM = dry erase materials
GW = gypsum wallboard
HS = hand sanitizer
MT = missing CT
NC = not carpeted
PC = photocopier
PF = personal fan
WD = water-damaged

Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferable
> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

Location: Lowell High School 1980 building **Indoor Air Results**

Address: 50 Father Morisette Blvd, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Library	553	ND	71	41	11	4	N	Y	Y	Old carpet, WD CTs and ceiling, reported allergy triggers
512	775	ND	72	44	8	7	N	Y	Y	HS, WD CT, WD GW
514	884	ND	73	43	8	11	N	Y	Y	
515	-	-	-	-	-	-	-	-	-	Locked
516	788	ND	72	42	10	9	N	Y	Y	
517	724	ND	72	42	9	1	Y	Y	Y	HS
518	693	ND	72	42	8	0	Y	Y	Y	MTs, HS, WD CT
522	653	ND	73	39	7	14	N	Y	Y	Computers, NC, DEM
523	764	ND	73	40	7	16	N	Y	Y	NC, DEM, dusty vents

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$\mu g/m^3$ = micrograms per cubic meter	AI = accumulated items	DEM = dry erase materials	MT = missing CT	PF = personal fan
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Location: Lowell High School 1980 building **Indoor Air Results**

Address: 50 Father Morisette Blvd, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
526	814	ND	72	41	8	23	N	Y	Y	DEM, NC
527	1021	ND	74	42	9	12	N	Y	Y	NC, DEM
533	626	ND	73	38	9	0	N	Y	Y	DEM, 1 WD CT
535	727	ND	74	40	8	30	N	Y	Y	PF – on, NC, 5 WD CT, food odors
537	790	ND	72	40	10	4	N	Y	Y	NC, 1 WD CT
542	688	ND	74	36	8	18	N	Y	Y	NC, DEM, computers
543	828	ND	74	37	13	30	N	Y	Y	DEM, NC
545	1075	ND	74	41	8	25	N	Y	Y	NC
546	842	ND	74	40	8	1	N	Y	Y	DEM, WD CT and MT (3)

ppm = parts per million	AF = air freshener	CT = ceiling tile	HS = hand sanitizer	PC = photocopier
$\mu g/m^3$ = micrograms per cubic meter	AI = accumulated items	DEM = dry erase materials	MT = missing CT	PF = personal fan
ND = non detect	CP = cleaning products	GW = gypsum wallboard	NC = not carpeted	WD = water-damaged

Comfort Guidelines

Carbon Dioxide:	< 800 ppm = preferable	Temperature:	70 - 78 °F
	> 800 ppm = indicative of ventilation problems	Relative Humidity:	40 - 60%

Location: Lowell High School 1980 building **Indoor Air Results**

Address: 50 Father Morisette Blvd, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m^3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
547	1022	ND	73	43	9	14	N	Y	Y	NC, chalk, DEM
552	505	ND	72	39	12	7	Y	Y	Y	WD CTs
553	607	ND	74	38	12	1	Y	Y	Y	DEM
554	735	ND	73	42	10	16	Y	Y	Y	DEM
555	661	ND	73	40	11	1	Y	Y	Y	DEM
556	958	ND	73	44	13	21	Y	Y	Y	MT
557	757	ND	73	41	12	0	Y	Y	Y	DEM
558	867	ND	73	44	11	27	Y	Y	Y	HS
First Floor										

ppm = parts per million	AF = air freshener	CT = ceiling tile	HS = hand sanitizer	PC = photocopier
µg/m^3 = micrograms per cubic meter	AI = accumulated items	DEM = dry erase materials	MT = missing CT	PF = personal fan
ND = non detect	CP = cleaning products	GW = gypsum wallboard	NC = not carpeted	WD = water-damaged

Comfort Guidelines

Carbon Dioxide:	< 800 ppm = preferable	Temperature:	70 - 78 °F
	> 800 ppm = indicative of ventilation problems	Relative Humidity:	40 - 60%

Location: Lowell High School 1980 building **Indoor Air Results**

Address: 50 Father Morisette Blvd, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Small Cafeteria	569	ND	72	41	8	~40	N	Y	Y	
Cafeteria	644	ND	72	40	7	~200	Y	Y	Y	Dust/debris on vents/CTs
Athletic Director Office	810	ND	73	43	8	1	N	Y	N	PC
Nurse's Suite	589	ND	74	46	9	3	Y	Y	Y	No airflow detected from vents
Wrestling Room	794	ND	72	43	6	28	N	Y	Y	MTs
Weight Room	733	ND	72	42	8	30	N	Y	Y	Dust/debris on vents, MTs
Girls Locker Room	545	ND	72	40	7	0	N	Y	Y	Dust/debris on vents, MTs, broken floor tiles
Girls Varsity Locker Room	528	ND	71	40	7	0	N	Y	Y	Dust/debris on vents, WD CTs
Cardio Room	589	ND	70	42	7	~25	N	Y	Y	MTs

ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter
ND = non detect
AF = air freshener
AI = accumulated items
CP = cleaning products
CT = ceiling tile
DEM = dry erase materials
GW = gypsum wallboard
HS = hand sanitizer
MT = missing CT
NC = not carpeted
PC = photocopier
PF = personal fan
WD = water-damaged

Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferable
> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F
Relative Humidity: 40 - 60%

Location: Lowell High School 1980 building **Indoor Air Results**

Address: 50 Father Morisette Blvd, Lowell **Table 1 (continued)** **Date: 10/25/2019**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Boys Locker Room	525	ND	72	42	9	0	N	Y	Y	Dust/debris on vents
Boys Varsity Locker Room	527	ND	71	40	6	4	N	Y	Y	Dust/debris on vents, MTs
412	612	ND	73	38	7	3	Y	Y	Y	Carpet
437	667	ND	74	38	5	0	N	Y	Y	Carpet
452C	796	ND	73	40	7	2	N	N	Y	Dust/debris on vents, door open
Field House										
Gym	672	ND	71	43	5	200+	N	Y	Y	Rubberized flooring

ppm = parts per million	AF = air freshener	CT = ceiling tile	HS = hand sanitizer	PC = photocopier
$\mu g/m^3$ = micrograms per cubic meter	AI = accumulated items	DEM = dry erase materials	MT = missing CT	PF = personal fan
ND = non detect	CP = cleaning products	GW = gypsum wallboard	NC = not carpeted	WD = water-damaged

Comfort Guidelines

Carbon Dioxide:	< 800 ppm = preferable	Temperature:	70 - 78 °F
	> 800 ppm = indicative of ventilation problems	Relative Humidity:	40 - 60%

APPENDIX A

Previous Recommendations

Conclusions/Recommendations from the visit made in July of 2017

The following recommendations are made to assist in improving IAQ:

1. Replace any water-damaged or mold-colonized porous building materials (e.g., ceiling tiles, gypsum wallboard, carpeting) in classrooms, hallways, and stairwell areas. Ensure water-damaged materials are cleaned, replaced, and/or repaired in a manner consistent with the U.S. Environmental Protection Agency's guidelines (US EPA, 2008).
2. Consult with a roofing contractor to assess the roofing system. Repairs should be made to stop leaks and chronic water damage to building materials. The roofing system should then be monitored regularly for water pooling, leaks, and other deteriorating conditions.
3. Consult with an HVAC contractor to thoroughly examine all HVAC system components to ensure proper function. Make any necessary repairs to ensure the system is working as designed.
4. Ensure that a system of regular "Operations and Maintenance" remains in place to keep HVAC systems in proper working order.
5. Consider adopting a balancing schedule of every 5 years for all mechanical ventilation systems, as recommended by ventilation industrial standards (SMACNA, 1994).
6. Operate all supply and exhaust ventilation equipment continuously during occupied periods. Do not block supply or exhaust vents with furniture or items.
7. Use openable windows to supplement fresh air during temperate weather. Ensure all windows are tightly closed at the end of the day. Inform occupants that windows should not be opened while the HVAC system is in cooling mode to avoid condensation.
8. Ensure chemical treatment of the pool is controlled to minimize pool odors. Ensure the exhaust system in the pool area is operating at all times and properly adjusted to effectively remove odors and moisture. In addition, ensure that doors between the pool and other occupied areas are weather-tight to prevent migration of odors and moisture.
9. Ensure any plumbing leaks are repaired to avoid chronic water damage in the building.
10. Ensure that condensation from AHU equipment is draining properly. Check collector pans, piping and any associated pumps for clogs and leaks and clean periodically to

prevent stagnant water build-up and remove debris that may provide a medium for microbial growth.

11. Ensure that doors are closed between areas with air conditioning and areas without air conditioning to avoid condensation of humid air on chilled surfaces.
12. Replace water-damaged and mold-colonized ceiling tiles after leaks have been addressed. Clean/remediate any moldy wall material consistent with the U.S. Environmental Protection Agency's guidelines (US EPA, 2008).
13. Replace any missing or ajar ceiling tiles to avoid pathways to unconditioned areas.
14. Consider utilizing MERV 8 filters in AHUs. Check with manufacturer's recommendations before changing filter efficiency. Continue to change filters 2-4 times a year.
15. Regularly clean supply/return vents and fans to avoid aerosolizing accumulated particulate matter.
16. Clean carpeting and area rugs annually or more often in high-traffic locations in accordance with IICRC recommendations (IICRC, 2012) and discard those that are worn out or too soiled to be cleaned.
17. Replace/repair fluorescent light covers; ensure fluorescent lights are fully secured to prevent breakage and clean debris out of covers.
18. Encourage faculty to report classroom/building related issues via a tracking program.
19. Continue to adopt the US EPA (2000) document, "Tools for Schools", as an instrument for maintaining a good IAQ environment in the building available at: http://www.epa.gov/iaq/schools/index.html.
20. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

Conclusions/Recommendations from the visit made in December of 2017

The following recommendations are for improving indoor air and environmental quality:

1. Consult with an HVAC contractor to thoroughly examine all HVAC system components to ensure proper function. Make any necessary repairs to ensure the system is working as

designed. Assess whether adjustments can be made to allow more fresh air into the system.

2. Operate all supply and exhaust ventilation equipment continuously during occupied periods. Do not block supply or exhaust vents with furniture or items. Check exhaust/return vents periodically for proper function.
3. Consider changing the style of fresh air vents or relocating them to prevent drafts (e.g., Hosmer office; Table 2).
4. Ensure that a system of regular "Operations and Maintenance" remains in place to keep HVAC systems in proper working order.
5. Consider adopting a balancing schedule of every 5 years for all mechanical ventilation systems, as recommended by ventilation industrial standards (SMACNA, 1994).
6. Use openable windows to supplement fresh air during temperate weather. Ensure all windows are tightly closed at the end of the day. Inform occupants that windows should not be opened while the HVAC system is in cooling mode to avoid condensation.
7. Replace any water-damaged or mold-colonized porous building materials (e.g., ceiling tiles, gypsum wallboard, carpeting) in the library, classrooms, hallways, and stairwell areas. Ensure water-damaged materials are cleaned, replaced, and/or repaired in a manner consistent with the U.S. Environmental Protection Agency's guidelines (US EPA, 2008).
8. Consult with a roofing contractor to assess the roofing system. Repairs should be made to stop leaks and chronic water damage to building materials. The roofing system should then be monitored regularly for water pooling, leaks, and other deteriorating conditions.
9. Consider removal of wall-to-wall carpeting in classrooms and other areas where spills, leaks or wear are a concern. Replace with non-porous flooring.
10. Avoid locating refrigerators and water dispensers in carpeted areas. Place on non-porous flooring or use a waterproof mat to protect the carpet.
11. Seal gaps in sink backsplashes with an appropriate waterproof sealant. Do not store porous items underneath or adjacent to sinks and safety showers/eyewashes.
12. Ensure doors seal tightly between air conditioned and non-air-conditioned areas and that these doors are closed when air conditioning is in use.
13. Ensure chemical treatment of the pool is controlled to minimize pool odors. Ensure the exhaust system in the pool area is operating at all times and properly adjusted to

effectively remove odors and moisture. In addition, ensure that doors between the pool and other occupied areas are weather-tight to prevent migration of odors and moisture.

14. Ensure any plumbing leaks are repaired to avoid chronic water damage in the building.
15. Ensure that condensation from AHU equipment is draining properly. Check collector pans, piping and any associated pumps for clogs and leaks and clean periodically to prevent stagnant water build-up and remove debris that may provide a medium for microbial growth.
16. Replace water-damaged and mold-colonized ceiling tiles after leaks have been addressed. Clean/remediate any moldy wall materials consistent with the U.S. Environmental Protection Agency's guidelines (US EPA, 2008).
17. Replace any missing or ajar ceiling tiles to avoid pathways to unconditioned areas.
18. Reduce the use of products containing VOCs.
19. Locate photocopiers and laminators in well ventilated areas away from occupants.
20. Store laboratory chemicals in an organized manner consistent with the guidance in Appendix A ("Guidance Concerning Proper Use and Storage of Chemicals in Schools to Protect Public Health").
21. Ensure Material Safety Sheets are available for all laboratory, maintenance and janitorial chemicals used in the building.
22. Consider utilizing MERV 8 filters in AHUs. Check with manufacturer's recommendations before changing filter efficiency. Continue to change filters 2-4 times a year.
23. Regularly clean supply/return vents and fans to avoid aerosolizing accumulated particulate matter. If soiled ceiling tiles around vents cannot be cleaned, replace.
24. Consider reducing the amount of items stored in classrooms to make cleaning easier. Periodically move items to clean flat surfaces.
25. Clean carpeting and area rugs annually or more often in high-traffic locations in accordance with IICRC recommendations (IICRC, 2012) and discard those that are worn out or too soiled to be cleaned.
26. Affix the electrical outlet in medical office to wall. Identify the purpose of the wires in the medical office and cap/remove as needed.
27. Encourage faculty to report classroom/building related issues via a tracking program.

28. The school should be tested for radon by a certified radon measurement specialist during the heating season when school is in session. Radon measurement specialists and other information can be found at: www.nrsb.org, and http://aarst-nrpp.com/wp.
29. Continue to adopt the US EPA (2000) document, “Tools for Schools”, as an instrument for maintaining a good IAQ environment in the building available at: http://www.epa.gov/iaq/schools/index.html.
30. Refer to resource manual and other related IAQ documents located on the MDPH’s website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

Appendix B

Carbon Dioxide and its Use in Evaluating Adequacy of Ventilation in Buildings

The Bureau of Environmental Health's (BEH) Indoor Air Quality (IAQ) Program examines indoor air quality conditions that may have an effect on building occupants. The status of the ventilation system, potential moisture problems/microbial growth and identification of respiratory irritants are examined in detail, which are described in the attached report. In order to examine the function of the ventilation system, measurements for carbon dioxide, temperature and relative humidity are taken. Carbon dioxide measurements are commonly used to assess the adequacy of ventilation within an indoor environment.

Carbon dioxide is an odorless, colorless gas. It is found naturally in the environment and is produced in the respiration process of living beings. Another source of carbon dioxide is the burning of fossil fuels. Carbon dioxide concentration in the atmosphere is approximately 250-600 ppm (Beard, 1982; NIOSH, 1987).

Carbon dioxide measurements within an occupied building are a standard method used to gauge the adequacy of ventilation systems. Carbon dioxide is used in this process for a number of reasons. Any occupied building will have normally occurring environmental pollutants in its interior. Human beings produce waste heat, moisture and carbon dioxide as by-products of the respiration process. Equipment, plants, cleaning products or supplies normally found in any building can produce gases, vapors, fumes or dusts when in use. If a building has an adequately operating mechanical ventilation system, these normally occurring environmental pollutants will be diluted and removed from the interior of the building. The introduction of fresh air both increases the comfort of the occupants and serves to dilute normally occurring environmental pollutants.

An operating exhaust ventilation system physically removes air from a room and thereby removes environmental pollutants. The operation of supply in conjunction with the exhaust ventilation system creates airflow through a room, which increases the comfort of the occupants. If all or part of the ventilation system becomes non-functional, a build up of normally occurring environmental pollutants may occur, resulting in an increase in the discomfort of occupants.

The MDPH approach to resolving indoor air quality problems in schools and public buildings is generally two-fold: 1) improving ventilation to dilute and remove environmental pollutants and 2) reducing or eliminating exposure opportunities from materials that may be adversely affecting indoor air quality. In the case of an odor complaint of unknown origin, it is common for BEH staff to receive several descriptions from building occupants. A description of odor is subjective, based on the individual's life experiences and perception. Rather than test for a potential series of thousands of chemicals to identify the unknown material, carbon dioxide is used to judge the adequacy of airflow as it both dilutes and removes indoor air environmental pollutants.

As previously mentioned, carbon dioxide is used as a diagnostic tool to evaluate air exchange by building ventilation systems. The presence of increased levels of carbon dioxide in indoor air of buildings is attributed to occupancy. As individuals breathe, carbon dioxide is exhaled. The greater the number of occupants, the greater the amount of carbon dioxide produced. Carbon dioxide concentration build up in indoor environments is attributed to inefficient or non-functioning ventilation systems. The Occupational Safety and Health Administration (OSHA) standard for carbon dioxide is 5,000 parts per million parts of air (ppm). Workers may be exposed to this level for 40 hours/week, based on a time-weighted average (OSHA, 1997).

Carbon dioxide can be a hazard within enclosed areas with **no air supply**. These types of enclosed areas are known as confined spaces. Manholes, mines and sewer systems are examples of confined spaces. An ordinary building is not considered a confined space. Carbon dioxide air exposure limits for employees and the general public have been established by a number of governmental health and industrial safety groups. Each of these standards of air concentrations is expressed in parts per million (ppm). *Table 1* is a listing of carbon dioxide air concentrations and related health effects and standards.

The MDPH uses a guideline of 800 ppm for publicly occupied buildings (Burge et al., 1990; Gold, 1992; Norback, 1990; OSHA, 1994; Redlich, 1997; Rosenstock, 1996; SMACNA, 1998). A guideline of 600 ppm or less is preferred in schools due to the fact that the majority of occupants are young and considered to be a more sensitive population in the evaluation of environmental health status. Several sources indicate that indoor air problems *are significantly reduced* at 600 ppm or less of carbon dioxide (ACGIH, 1998; Bright et al., 1992; Hill, 1992; NIOSH, 1987). Inadequate ventilation and/or elevated temperatures are major causes of complaints such as respiratory, eye, nose and throat irritation, lethargy and headaches.

Air levels for carbon dioxide that indicate that indoor air quality may be a problem have been established by the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE). Above 1,000 ppm of carbon dioxide, ASHRAE recommends adjustment of the building's ventilation system (ASHRAE, 1989). In 2001, ASHRAE modified their standard to indicate that no more than 700 ppm above the outdoor air concentration; however 800 ppm is the level where further investigation will occur.

Carbon dioxide itself has no acute (short-term) health effects associated with low level exposure (below 5,000 ppm). The main effect of carbon dioxide involves its ability to displace

oxygen for the air in a confined space. As oxygen is inhaled, carbon dioxide levels build up in the confined space, with a decrease in oxygen content in the available air. This displacement of oxygen makes carbon dioxide a simple asphyxiant. At carbon dioxide levels of 30,000 ppm, severe headaches, diffuse sweating, and labored breathing have been reported. No **chronic** health effects are reported at air levels below 5,000 ppm.

Air testing is one method used to determine whether carbon dioxide levels exceed the comfort levels recommended. If carbon dioxide levels are over 800-1,000 ppm, the MDPH recommends adjustment of the building's ventilation system. The MDPH recommends that corrective measures be taken at levels above 800 ppm of carbon dioxide in office buildings or schools. (Please note that carbon dioxide levels measured below 800 ppm may not decrease indoor air quality complaints). Sources of environmental pollutants indoors can often induce symptoms in exposed individuals regardless of the adequacy of the ventilation system. As an example, an idling bus outside a building may have minimal effect on carbon dioxide levels, but can be a source of carbon monoxide, particulates and odors via the ventilation system.

Therefore, the MDPH strategy of adequate ventilation coupled with pollutant source reduction/removal serves to improve indoor air quality in a building. Please note that each table included in the IAQ assessment lists BEH comfort levels for carbon dioxide levels at the bottom (i.e. carbon dioxide levels between 600 ppm to 800 ppm are acceptable and <600 ppm is preferable). While carbon dioxide levels are important, focusing on these air measurements in isolation to all other recommendations is a misinterpretation of the recommendations made in these assessments.

Table 1: Carbon Dioxide Air Level Standards

Carbon Dioxide Level	Health Effects	Standards or Use of Concentration	Reference
250-600 ppm	None	Concentrations in ambient air	Beard, R.R., 1982 NIOSH, 1987
600 ppm	None	Few indoor air complaints, used as reference for air exchange for protection of children	ACGIH, 1998; Bright et al., 1992; Hill, 1992; NIOSH 1987
800 ppm	None	Used as an indicator of ventilation adequacy in schools and public buildings, used as reference for air exchange for protection of children	Mendler, 2003 Bell, A. A., 2000; NCOSP, 1998; SMACNA, 1998; EA, 1997; Redlich, 1997; Rosenstock, 1996; OSHA, 1994; Gold, 1992; Burge et al., 1990; Norback, 1990 ; IDPH, Unknown
1000 ppm	None	Used as an indicator of ventilation inadequacy concerning removal of odors from the interior of building.	ASHRAE, 1989
950-1300 ppm*	None	Used as an indicator of ventilation inadequacy concerning removal of odors from the interior of building.	ASHRAE, 1999
700 ppm (over background)	None	Used as an indicator of ventilation inadequacy concerning removal of odors from the interior of building.	ASHRAE, 2001
5000 ppm	No acute (short term) or chronic (long-term) health effects	Permissible Exposure Limit/Threshold Limit Value	ACGIH, 1999 OSHA, 1997
30,000 ppm	Severe headaches, diffuse sweating, and labored breathing	Short-term Exposure Limit	ACGIH, 1999 ACGIH. 1986

* outdoor carbon dioxide measurement +700 ppm

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Appendix C

Commonwealth of Massachusetts
Department of Public Health
Helping People Lead Healthy Lives In Healthy Communities

BUREAU OF ENVIRONMENTAL HEALTH

Indoor Air Quality Program

Methods Used to Reduce/Prevent Exposure to Construction/Renovation Generated Pollutants in Occupied Buildings

November 2006

Among the most serious indoor air quality health issues is the potential exposure to construction/renovation-generated pollutants in occupied buildings. The renovation of occupied buildings provides a number of potential exposure opportunities to pollutants. Demolition of the building materials can provide exposure to mold, asbestos, lead, bird waste and other respiratory irritants. The application of tile adhesive, roofing materials, paints and other products used during renovations provide point sources of volatile organic compounds (VOCs) and other irritating chemicals. Contractors frequently use fossil fueled construction and heating equipment in indoor areas undergoing renovations. Combustion products (e.g. carbon monoxide) can migrate into occupied areas. The impact of construction/renovation pollutants on occupied areas can be evaluated through air monitoring for VOCs, airborne particles and products of combustion. Preventing and/or minimizing exposure to construction/renovation-generated pollutants is essential to reduce indoor air-related symptoms in building occupants.

In 1999, the State Department of Education (DOE) amended their regulations to require that state funded construction projects follow established guidelines to prevent exposure of building occupants to construction/renovation pollutants. Subsequently, Chapter 208 of the Acts of 2004 transferred responsibility for the School Building Assistance Program from the DOE to the Massachusetts School Building Authority (MSBA). On September 6, 2006, the MSBA enacted regulations that require that schools receiving funds under the program for construction or renovation projects must confer with the most current edition of the "IAQ Guidelines for Occupied Buildings Under Construction" published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) 963 CMR 2.04(2)(c),(d).

The MDPH has prepared this guidance in order to prevent/reduce the migration of renovation-generated pollutants into occupied areas and their potential impact on indoor air quality. The MDPH suggests that the following steps be taken on any renovation project within a public building.

Physical Isolation of Occupied Areas from Renovation Areas

Renovations of buildings should be separated from occupied areas by constructing temporary

physical barriers. These barriers are typically constructed of plywood and polyethylene plastic built in or over passageways between the construction area and the occupied spaces. Construction barriers should be sealed with polyethylene plastic and duct tape on the construction side as well as the occupied side to provide a duel barrier. Inspection of these barriers should be conducted daily prior to commencement of construction activities to ensure integrity. A log of the location and condition of each barrier should be maintained in a log book.

Other migratory pathways for pollutants to move between construction and occupied areas should be examined and sealed. These migratory pathways may include but are not limited to:

- Crawlspaces
- Electrical outlets and light switches in shared walls
- Pipe and electrical conduits between walls
- Ventilation system ductwork
- Holes in interior walls and/or spaces above interior walls and roof/floor decking (e.g., spaces above ceiling tile systems).

Outdoor construction-generated pollutants can migrate indoors under various conditions. The following are recommendations to reduce migration of *outdoor* pollutants to the indoor environment:

- Seal around exterior doors with weather stripping and door sweeps to prevent infiltration of outdoor construction-generated pollutants.
- Cover with tarps any dirt/debris piles in close proximity to the building or wet down dirt/debris to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.
- Temporarily deactivate the HVAC system during construction generating high amounts of outdoor pollutants. If activity is longer than one day, alternative means of ventilation should be provided for the impacted areas. If not feasible, relocation of activities in these areas should be considered.

The Use of Pressurization/Depressurization Techniques

Construction sites should be isolated and depressurized compared with occupied areas to control for renovation pollutants. To achieve depressurization, use fans to draw air away from occupied areas. Use of the existing supply ventilation system to introduce fresh outside air into occupied space should be used to increase air pressure in occupied areas adjacent to construction activities. In order to assess whether depressurization has occurred, air pressure monitoring (using a micromanometer) to measure air pressure differential between occupied space and construction areas should be used. Monitoring should be done daily at each barrier to ensure appropriate pressurization. Results of the

location, dates and results of air pressure monitoring should be kept in a log book. No construction work should occur in areas immediately adjacent to occupied areas if:

- Depressurization is not achieved,
- Air pressure monitoring has not been done that day, or
- Odor/construction related complaints have been made by occupants in adjacent areas.

Operation of the Existing Ventilation Systems

Precautions should be taken to avoid the *re-entrainment* of construction-related materials into the building's HVAC system. The design of each system must be assessed to determine how it may be impacted by renovation activities and contingency plans to maintain adequate supply of fresh air and temperature must also be developed and implemented to maintain building occupant safety and comfort. Specific HVAC protection requirements pertain to the return, central filtration and supply components of the ventilation system. This may entail shutting down systems (when possible) during periods of heavy construction and demolition, ensuring systems are isolated from contaminated environments, sealing ventilation openings with plastic and using filters with a higher dust spot efficiency where needed.

Administrative Management to Prevent Exposure to Construction Generated Pollutants

Various administrative actions can also prevent occupant exposures to construction/renovation-generated pollutants. The following measures should be used to prevent, eliminate or reduce occupant exposure to construction-generated pollutants:

- Schedule projects that produce large amounts of dusts, odors and emissions during unoccupied periods or periods of low occupancy.
- Develop a notification system for building occupants to report construction/renovation related odors and/or dust problems to the building administrator. These concerns should be relayed to the contractor in a manner to allow for a timely remediation of the problem.
- Disseminate scheduling itinerary to all affected parties; this can be done in the form of meetings, newsletters or weekly bulletins.
- Notify occupants about construction activities that may be conducted in close proximity to their work areas. In certain cases, HVAC equipment for areas adjacent to construction activities may need to be deactivated and windows closed periodically to prevent unfiltered air and vehicle exhaust from entering the building. For this reason, prior notification(s) should be made.
- If possible, relocate susceptible persons and those with pre-existing medical conditions (e.g., hypersensitivity, asthma) away from areas of renovations.
- Keep Material Safety Data Sheets (MSDS) for all construction materials used during renovations in an area that is accessible to all individuals during periods of building operations as required by the Massachusetts Right-To-Know Act.

Appendix C

Control/Reduction of Pollutants in Occupied Areas

Frequently, renovations include the replacement of components of the HVAC system, rendering windows as the only source of fresh air. In this environment, removal of normally occurring pollutants as well as construction-generated pollutants must be enhanced to reduce exposure.

The following recommendations are made to reduce exposure under these circumstances:

- Implement prudent housekeeping and work site practices to minimize exposure to renovation pollutants. This should include daily cleaning of occupied areas during the course of renovation work generating dust, fumes and other particulate materials.
- Consider increasing the number of personnel or work hours for existing staff (e.g., before school) to provide increased cleaning of dirt/dust accumulation in occupied areas due to construction/renovation activities.
- Control for dusts by using a high efficiency particulate air filter (HEPA) equipped vacuum cleaner in conjunction with wet wiping/mopping of all surfaces.
- Cover with tarps any dirt/debris piles (indoors and outdoors) in close proximity to the building or wet down dirt/debris (outdoors) to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.

Inspection upon Request

The Massachusetts Department of Public Health, Bureau of Environmental Health, Indoor Air Quality Program, is available to inspect a public building upon receipt of a written request for inspection from and in cooperation with the appropriate government agency.

QUESTIONS

If you have any questions concerning these guidelines, please contact:

Massachusetts Department of Public Health
Bureau of Environmental Health, Indoor Air Quality Program
250 Washington Street, 7th Floor
Boston, MA 02108
Phone: (617) 624-5757 Fax: (617) 624-5777

Document Reviewed: August 2008

Board of Health Meeting – January, 2019
Community Health Division, Lowell Health Department

Community Health Coordinator (CHC)
Kate Elkins

Healthy Living in Lowell

- The CHC produced a January episode of Healthy Living in Lowell focused the newly released Greater Lowell Community Health Needs Assessment. The show featured Kerrie D'Entremont from the Greater Lowell Health Alliance and Lisa Taylor-Montminy from Lowell General Hospital Community Benefits.
- A February show will focus on heart health and guests are still be selected for the episode.

Access to Equitable Physical Activity

- The City of Lowell was awarded a grant from the Blue Cross Blue Shield of Massachusetts Foundation to establish more equitable opportunities for physical activity in Lowell over a three-year period.
- The walking routes project, now named, "Healthy Walking Trails" is moving along and the CHC will be working with the Planning and Development department to perform outreach in the Centerville neighborhood to get the project off the ground.

Employee Health and Wellness

- The CHC is working with the city's health and wellness committee to plan for the 2020 calendar year of activities.

Vision 2020 Grant

- The Health Department was awarded funding from the Greater Lowell Health Alliance in October to implement a new vision program within the School Health Unit. This grant will assist with better screening equipment for our youngest children and an enhanced vision referral system. The CHC wrote the grant and is now assisting the School Health Unit with some of the grant objectives.
- A Welch Allyn SPOT vision screener has been ordered and testing will begin in the new year
- Prevent Blindness is consulting on improved referrals systems and work is underway.

Spacers for Kids Project

- The Greater Lowell Health Alliance awarded the Greater Lowell Community Foundation (GLCF) with grant funds to launch a new initiative titled, Asthma Spacers for School Kids. This program aims to provide free spacers to school-aged children with a known asthma diagnosis in the Greater Lowell region.
- All spacers have been delivered to the health department and will be distributed in the new year; the CHC is assisting the School Health Unit with this effort. Please see news article that ran regarding the effort in the Lowell Sun on Sunday, Dec. 8 - https://www.lowellsun.com/2019/12/08/devices-for-asthma-to-be-distributed-to-students/

Additional Notes

- The CHC is planning a maternity leave for April – July and is actively working on planning for this process during this time.

Lowell Health Department Public Health Nursing

November 2019

Submitted by Colleen da Silva RN,BSN

Communicable Diseases Reported

Disease	Nov. 2018	Nov. 2019	2018 Total	2018 YTD	2019 YTD
Amebiasis					
Anthrax			1	1	
Arbovirus			2	1	1
Babesiosis			4	4	1
Borrelia miyamotoi infection			1	1	
Botulism			1		
Calcivirus/Norovirus			5	3	2
Campylobacteriosis	1	3	15	14	14
Clostridium perfringens			1	1	
Cryptococcus neoformans			1	1	1
Cryptosporidiosis	2		19	14	10
Cyclosporiasis					1
Dengue Fever			1	1	2
Ehrlichiosis		1	1	1	3
Enterovirus					
Giardiasis	2	1	16	15	25
Group A Streptococcus	6	5	59	57	50
Group B Streptococcus	1		14	13	10
Haemophilus Influenzae		1	1	1	2
Hepatitis A	1		8	6	11
Hepatitis B	17	8	117	111	104
Hepatitis C	17	19	212	196	193
Hepatitis D					1
Human Granulocytic Anaplasmosis	2		11	11	3
Influenza	37	24	1732	1575	1020
Invasive bacterial infection (other)			1	1	2
Legionellosis			11	10	9
Lyme Disease	9	2	74	72	65
Malaria	1		2	1	3
Measles	1confirmed 29 contacts 7 revoked	1 suspect	1confirmed 29 contacts 10 revoked	1confirmed 29 contacts 10 revoked	7 revoked
Meningitis – Unknown Type			1	1	3
Meningococcal Disease					1

Mumps	2 suspect 1 revoked	1 suspect	1probable 1 revoked 2 suspect	1 probable 1 revoked 2 suspect	1 suspect 1 revoked
Pertussis (and other Bordatella species)			1	1	
Rocky Mountain Spotted Fever			1	1	
Rubella	1		1	1	
Salmonellosis			18	17	20
Shiga toxin producing organism			1	1	
Shigellosis			1	1	1
Streptococcus pneumoniae	4		19	16	5
Toxoplasmosis			1	1	
Varicella			9	9	15
Viral Meningitis (aseptic)			1	1	2
West Nile Virus Infection		1			1
Yersiniosis					
Zika Virus Infection			1	1	

*denotes case is connected to a foodborne illness investigation

Tuberculosis Cases Reported

	Nov. 2018	Nov. 2019	2018 Total	2018 YTD	2019 YTD
TB LTBI	34	26	342	317	343
TB Active	3 revoked	1 confirmed 1 revoked	9 confirmed 19 revoked	9 confirmed 19 revoked	10 confirmed 11 revoked 1 suspect
B1 Waivers	2	0	14	14	9

Total of 34 DOTs done in November 2019

Refugee Arrivals

Total Families/Total Persons

Nov. 2018	Nov. 2019	2018 Total	2018 YTD	2019 YTD
2/9	0/0	29/76	23/66	26/76

Immunizations

Vaccine	Nov. 2018	Nov. 2019	2018 Total	2018 YTD	2019 YTD
Influenza	28	31	372	371	331
Hepatitis A	0	0	4	0	0

Public Health Nurse Activities

Participated in 2 flu clinics held at the Cambodian Mutual Assistance Association

Participated in flu clinic at Lowell House

Attended Mass. Assoc. of Public Health Nurses Meeting at Tewksbury State Hospital

Public Health Nurse Manager Activities

Begin planning for MDPH Emerging Infectious Disease table top exercise in January 2020

Participated in 2 flu clinics held at the Cambodian Mutual Assistance Association

Continued training new public health nurse

Attended Mass. Assoc. of Public Health Nurses Meeting at Tewksbury State Hospital

Participated in DOTs and PPD testing/reading with new public health nurse

Attended Tier II Emergency Management Team meeting at EOC

Board of Health November 2019 School Health Unit

Immunization survey submitted to the state with 100% compliance.

Nurse Coordinator & Managers met with Lowell Community Health Center Management team to review immunization laws related to school entry and to work collaboratively to get new students into school.

SBIRT screenings completed for grade 9 at the Freshman Academy.

Epipen training completed for LHS fall coaching staff.

Nurse Coordinator & Managers participated in the following meetings & trainings:

- LHS Building Meeting
- Nurse Leadership Training
- Early Childhood Forum
- School Safety Summit

School Nursing Services Provided	18-Nov	19-Nov	Total 18-19	YTD 2018	YTD 2019
Total Student Encounters					
Totals	13,335	13,620	135,213	43,343	46,249
911 Emergency Calls					
Student	6	7	68	27	18
Staff	6	1	20	10	5
Medication Administration					
Totals	4,104	3,813	40,540	12,224	11,727
Nursing Assessment					
Student	8,928	8,961	92,053	29,688	31,911
Staff	77	30	425	164	136
Glucose Testing	686	684	6,316	2,220	2,104
Nausea/vomiting	1,020	976	10,808	3,337	3,374
Tube Feedings	233	172	2,019	597	583
pulse Oximetery	19	10	108	57	62
Screenings					
Vision	1,548	902	8,912	3,790	3,009
Hearing	1,194	688	7,661	2,580	2,012
BMI	431	1,015	3,626	933	1,373
Postural	91	201	4,015	166	297
Freshman Academy SBIRT		486			

Board of Health Report – January 8th, 2020

Substance Abuse and Prevention Division, Lowell Health Department

Please be advised that the content of this report is from the 12/01/2019 through 12/12/2019.

Substance Abuse Coordinator, Division Manager

Lainnie Emond, LMHC

Prescription Drug Monitoring Program (PDMP) Grant Initiatives:

- Continuing to work with the Co-Chairs of the Mayor's Opioid Epidemic Crisis Task Force to plan monthly meeting agendas, identify potential initiatives, contact presenters, and invite new agencies to participate.
    - *Recent and Upcoming Meetings: No December meeting. January 27th from 5:30-6:30pm (location TBD).*
- Continuing to lead Data Subcommittee of the Mayor's Opioid Task Force. Subcommittee members are working on the fifth "Opioid Trends in Lowell, MA" report, which focuses on HIV and opioid overdose in Lowell.
- Continuing to co-lead Media Subcommittee meeting of the Mayor's Opioid Task Force. Subcommittee also finalized two social media images: one highlights that Narcan freezes, and the other highlights that more nonfatal overdoses occur indoors during the winter weather months.
- Continuing to working to identify a specific documentation system to demonstrate how the Substance Abuse Coordinator (SAC) position and the Substance Abuse and Prevention Division have impacted the Lowell Health Department and provider community. This information is important to incorporate into grant reporting as the SAC position has positively expanded beyond the expectations written into the grant.

Lowell CO-OP and Related Efforts:

- Lainnie continues to be involved in administrative planning for the Lowell CO-OP, including co-facilitating Lowell CO-OP Supervisors Meetings and working with team and grant partners to ensure effectiveness of the team.

Additional Substance Abuse Coordinator Activities:

- Managing daily activities of the Substance Abuse and Prevention Division.
- Lainnie is the point person for www.DrugFreeGreaterLowell.org. Marketing materials have been designed and are being distributed to partners in Greater Lowell, which include an email signature, social medial images, 11x18 foam boards, business cards, and pens.
- Lainnie is continuing to work with colleagues from Tufts University and Trinity EMS to work on a scientific research paper examining how EMS interacts with patients prior to experiencing a fatal overdose.
- The Substance Abuse and Prevention Division created a position, "Community Outreach Educator", specifically for Mass Hire/Lowell Career Center's Disaster Recovery National Dislocated Worker Grant to enhance the outreach efforts of the Division. Linda Bellantoni started on December 9th, 2019.

Massachusetts Opioid Abuse Prevention Collaborative (MOAPC)

*** Lainnie Emond will oversee the MOAPC Grant through the end of the grant cycle, June 30th, 2019. ***

Strategy One (implement Life Skills Training across the cluster): *Life Skills Training is an evidenced based prevention curriculum supported by the Bureau of Substance Addiction Services.*

- No updates at this time.

Grant Strategy Two (coordination and promotion of education on harm reduction strategies):

- Several organizations within the MOAPC cluster offer Narcan training and Narcan kits.
- Discussed the desire to identify if there are trends in overdoses across town boarders (ie. if there is an overdose spike in one town, will there be a similar spike in another town on the same day or possibly the days following?). Lainnie created an Excel document that tracks fatal and nonfatal overdoses per day for the years 2016-2019. Point people in the Greater Lowell MOAPC Cluster towns have been provided with this document and were offered the opportunity to add their tracking numbers for fatal and nonfatal overdoses.

Drug Free Greater Lowell Website

- www.DrugFreeGreaterLowell.org is live. The MOAPC grant funded informational business cards and other outreach materials to promote the website.
- Analytics will be available upon the close of the calendar year to provide a year-end summary.
- The MOAPC grant funded Drug Free Greater Lowell marketing and outreach materials for the second annual Merrimack Valley Substance Use Disorder Symposium that was held on December 6th at the Westford Regency. Lainnie and Kate Elkins, Lowell Health Department's Community Health Coordinator, held a table at the Symposium to highlight the website further and to educate attendees on the Lowell Health Department's prevention efforts.

Unwanted Medication and Sharps Disposal

- The Lowell Health Department held the final Unwanted Medication and Sharps Disposal of the 2019 calendar year on December 3rd.
- Totaling up all **2019 Disposal Day**s, participants disposed of **470 pounds of unwanted medications** and **719 pounds of unwanted sharps**.

Unwanted Medication and Disposal Day Data Collection – 2019 Data

Event Date	Medication (lbs)	Sharps (lbs)	Total Attendees
3/13/2019	255	317	162
6/11/2019	54	196	76
6/15/2019	18	25	*Closed Collection for School Nurses*
8/13/2019	85	111	67
12/03/2019*	58	70	38

**Please note that there was a snow storm the morning of 12/03/2019.*

Partnerships for Success (PFS)

*** Lainnie Emond will act as interim coordinator of the PFS grant until the position is filled. ***

Strategy One (social media and education dissemination to high school-aged youth re: sharing prescription medications):

PFS Social Media Campaign:
- Social media campaign has been placed on hold until a new PFS Coordinator is hired.

Strategy Two (social media and education dissemination to parents/guardians and high school-aged youth re: proper disposal and storage):

"Help Keep Our Kids Safe" Campaign
-Community Health Educator, Kate Elkins, is continuing efforts to create a two-sided handout giving tips on the proper storage of prescription medication as well as identifying medication disposal sites in Lowell. This handout will be distributed to the general public with a specific focus on parents/caregivers of local youth.

Monthly Meeting:
Monthly coalition meeting is scheduled for January 15th, 2020.

Outreach Health Educator Position:
Position was posted from October 25th through November 8th. First round interviews occurred the week of November 18th, and second round interviews were held the week of December 2nd.

Lowell Community Opioid Outreach Program (CO-OP)
Maricia Verma, Lowell CO-OP Supervisor

Lowell CO-OP Data 2019

--	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total Encounters	78	76	32	47	88	58	41	48	74	33	41	--	**616**
Unique Encounters	--	37	28	29	52	34	28	36	53	16	34	--	**347**
Initial Interaction	--	9	6	9	17	3	7	13	12	2	15	--	**93**
OD Follow-Up	2	8	9	11	17	3	6	9	29	4	10	--	**108**
Section 35	2	1	0	1	5	1	1	2	2	0	5	--	**20**
Clinical Clients	7	7	5	4	3	2	2	2	2	2	2	--	**38**
Disseminate Narcan	0	0	3	6	13	4	20	5	25	5	37	--	**118**
SUD Treatment	11	15	14	12	14	14	18	14	22	11	8	--	**153**
Medical Treatment	0	1	0	5	3	4	4	5	4	1	1	--	**28**
Other Services	7	1	2	8	4	8	3	2	11	1	0	--	**47**
Misc. Outreach	--	--	--	--	--	156	223	464	71	72	132	--	**1118**

Outreach and Educational Events

Date	Event Type	Location	Topic	Attendance
11-20-2019	Educational Presentation	Robinson Middle School	Mental Health, Substance Abuse	25

Relationship Building

Date	Organization	Relationship Building
11-15-19	CTI	CO-OP Supervisor attended CTI's Youth Provider Meeting.

Additional

- The Clinical Recovery Specialist position was reposted on 11/21 and will remain open until 12/16.
- Lowell CO-OP Supervisor and Lowell CO-OP team members attended the Merrimack Valley Substance Use Disorder Symposium on 12/6 at the Westford Regency.

Syringe Collection Program

Andres Gonzalez, Syringe Collection Program Coordinator (SCPC)

City Department and Community Partner Engagement:

- Middlesex Community College
- Lowell Community Health Center
- Lowell Charter School
- Office of the City Manager
- Lowell CO-OP
- Department of Planning & Development
- Lowell Street Department
- Lowell Police Department
- Lowell Parks Department

Community Events Attended:

- 12/3 Unwanted Medication and Sharps Disposal Day
- 12/4 Hunger Homeless Commission (HHC)
- 12/6 Merrimack Valley Substance Use Disorder Symposium

Areas Proactively Swept for Discarded Syringes:

- Hunts Falls Bridge
- Suffolk Streer Bridge
- Howe Street (Middlesex College)
- Morey School
- George Street
- Favor Street
- Lowell Justice Center
- Rogers Street Bridge
- Rogers Stem Academy
- South Common Park

Syringe Collection Activity 2019

Total Number Of…	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec 1st – 11th	Total
Discarded syringe pick-up requests	8	6	8	21	22	35	38	22	---	164
Incoming calls for syringe pick-up requests	6	21	20	17	14	14	14	11	---	121
Syringes picked-up while responding to all discarded syringe pick-up requests	49	240	334	256	157	337	322	113	---	1,830
Hours proactively picking-up discarded syringes in the community	9	20	25	29	41	49	35	44	---	258
Syringes proactively picked-up while in the community	493	967	488	1231	895	1040	845	896	---	6,999
Syringes picked up during Community Clean-up Events	0	11	75	49	16	131	161	0	---	433

**Please note that there was a snow storm on December 2nd and 3rd that resulted in no incoming pick-up requests and no proactive pick-ups.*