

# **CRASH COURSE ON SCHOOL AIR QUALITY IN NEW BRUNSWICK**

# **SCHOOL AIR QUALITY**

- **Background information**
- **Current air quality testing & reporting in NB schools**
- **Overview of mechanical ventilation in schools**
- **Ways to improve air quality in your classroom**
- **Why this matters**

# DISCLAIMER

## Immersion plan unanimously denounced as Saint John meeting draws large crowd

Minister says there's 'lots of time' to opt for keeping immersion this fall

Jacques Poitras - CBC News - Posted: Jan 25, 2023 7:47 AM AST | Last Updated: January 25, 2023

f X    258 comments



## Liberal MLA seeks to improve air quality in public buildings, reduce spread of airborne illnesses

COVID-19 highlights importance of indoor air quality and protecting citizens, says Gilles LePage

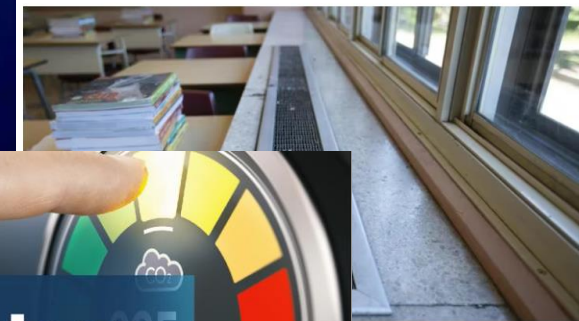
Bobbi-Jean MacKinnon - CBC News - Posted: Apr 12, 2023 7:00 AM ADT | Last Updated: April 12, 2023



## N.B. passes Opposition motion to improve air quality in public buildings

Liberal motion receives unanimous support but is not binding on the government

Bobbi-Jean MacKinnon - CBC News - Posted: Jun 09, 2023 6:01 PM ADT | Last Updated: June 9, 2023



- I am a teacher, a parent – and, recently, an occasional writer, interviewee & presenter.
- I am not:
  - An engineer
  - An occupational hygienist
  - A medical professional
  - A physicist
  - A lot of other things

Review of Policy 713, 9th message

Murphy, Ryan M (ASD-S)

To: Daniel.Allain@gnb.ca; Richard.Ames@gnb.ca; Andrea.AndersonMason.Guy.Arseneault@gnb.ca; Kris.Austin@gnb.ca; Kathy.Bockus@gnb.ca; Ben.Dominic.Cardy@gnb.ca; Jeff.Carr@gnb.ca; Chuck.Chiasson@gnb.ca; Keith.Michelle.Conroy@gnb.ca; David.Coon@gnb.ca; Gary.Crossman@gnb.ca; Jean-Claude.D'Amours@gnb.ca; Mike.Dawson@gnb.ca; Arlene.Dunn@gnb.ca; Hugh.Flemming@gnb.ca; Robert.Gauvin@gnb.ca; Jill.Green@gnb.ca; Trev.Mike.Holland@gnb.ca; Susan.Holt@gnb.ca; Margaret.Johnson@gnb.ca; F.Jacques.J.LeBlanc@gnb.ca; Marco.LeBlanc@gnb.ca; Rene.Lepacv@gnb.ca; Richard.Losier@gnb.ca; Eric.Mallet@gnb.ca; Robert.McKe.Glen.Savoie@gnb.ca; Rejean.A.Savoie@gnb.ca; Tammy.Sc.Ernie.Steeves@gnb.ca; Isabelle.Theriault@gnb.ca; Greg.Tu.Mary.Wilson@gnb.ca; Sherry.Wilson@gnb.ca

Members of the Legislative Assembly of the Province of New Brunswick

I write again.

While I had hoped for the day this would not be necessary for many of you had also so hoped.)

My previous messages were sent to all 49 Members



# Clean Indoor Air Expo

25 PPM

5000

Join the Clean Air Revolution



# BACKGROUND INFORMATION

What makes air “good” or “bad”?

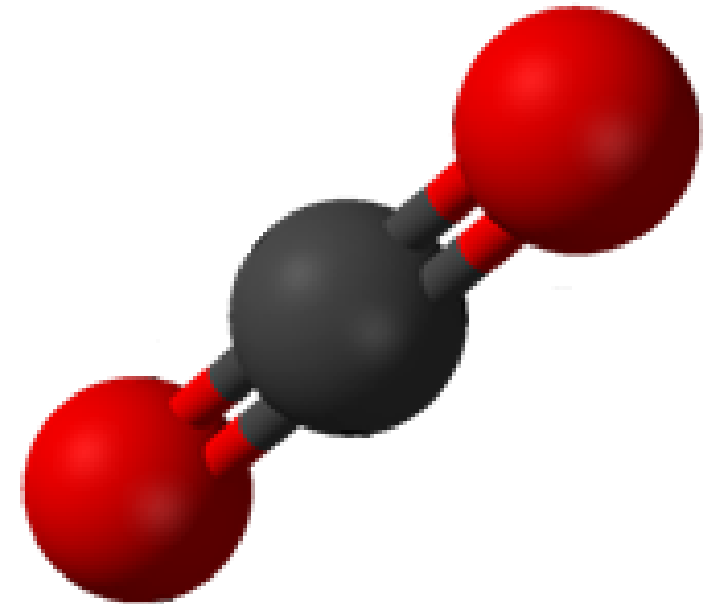
Why is air quality a concern now?

What regulations govern indoor air quality?

# GLOSSARY

## Carbon dioxide (CO<sub>2</sub>)

- By-product of respiration used as a proxy to measure air quality and the rate at which air is being renewed. Increasing indoor CO<sub>2</sub> levels indicate an increase in exhaled air in a space - or the air is being rebreathed. This is different than safe exposure levels, which indicate at what concentration acute health effects are seen. Research has also shown academic performance and attention declines with increased levels of carbon dioxide.



# GLOSSARY

## Indoor Air Quality (IAQ):

- The air quality within and around buildings and structures. IAQ is known to affect the health, comfort, and well-being of building occupants. **Poor indoor air quality has been linked to sick building syndrome, reduced productivity, and impaired learning in schools.** IAQ is evaluated through collection of air samples, monitoring human exposure to pollutants, analysis of building surfaces, and computer modelling of air flow inside buildings.



# GLOSSARY

## Particulate Matter (PM):

- Particulates are microscopic particles of solid or liquid matter suspended in the air. The term aerosol commonly refers to the particulate /air mixture, as opposed to the particulate matter alone.
- **PM<sub>2.5</sub>**: Fine particles with a diameter of 2.5  $\mu\text{m}$  or less. Examples include combustion particles, organic compounds, metals.
- **PM<sub>10</sub>**: Coarse particles with a diameter of 10  $\mu\text{m}$  or less. Examples include dust, pollen, mold.



# THE BEST AIR: OUTDOORS

- Typical (current) outdoor CO<sub>2</sub> levels:  
**420 – 430 PPM**
- This value is used as a baseline for measuring the quality of indoor air
- Indoor CO<sub>2</sub> levels are higher than outdoor CO<sub>2</sub> levels.
- The difference between those two levels shows how much CO<sub>2</sub> people, animals, or machines have added to the indoor air





# WHAT MAKES INDOOR AIR BAD?

- We can't always be breathing outdoor air.
- Air in schools is outdoor air **with extra:**
  - CO<sub>2</sub> from breathing
  - Dust and chemistry experiments and art projects
  - Airborne pathogens exhaled from infected folks (or sneezed, coughed...)
    - Measles
    - Tuberculosis
    - Covid-19
    - RSV
    - Influenza
    - Whooping Cough
    - Strep



# WHY ARE WE TALKING ABOUT INDOOR AIR QUALITY NOW?

- Because we can, and because we need to.
- So much has been learned about indoor air quality in the last four years. We have a responsibility to take what has been learned and use it to improve the lives of our ourselves and those around us.
- In N.B schools, teachers are supported by the **Principles of the NBTA Professional Conduct and Standards**, specifically the requirements that:
  - Teachers shall regard as their first obligation the student's physical, social, moral and educational growth.
  - Teachers have regard for the safety of their students.
  - Teachers recognize the special position of trust and responsibility which they assume in their guidance of young people.

## N.B. students missed 250,000 days in November, data shows

Department of Education can't say if increase in absences is due to COVID-19, flu, RSV, or illness at all



Bobbi-Jean MacKinnon - CBC News - Posted: Jan 18, 2023 9:12 PM AST | Last Updated: January 18, 2023



Public Health has asked schools to share when their absence rates climb 10 per cent above normal absence rates, said Jennifer Read, spokesperson for the Anglophone School District - West. (Tobias Arnelger/Shutterstock)

# WHY ARE WE TALKING ABOUT INDOOR AIR QUALITY NOW?

- The Province of New Brunswick's **Occupational Health and Safety Policy** (Finance and Treasury Board, applicable to all individuals employed in all parts of the Public Service), states in relevant part that:
  - “It is the policy of the provincial government, as employer, to provide and maintain healthful working conditions and procedures which are:
    - **conducive to the health and safety of employees...**”.
  - **“The Employees are responsible for conducting themselves to ensure their own health and safety and that of other persons at, in or near their place of employment.”**

## Teacher shortage at 'crisis point' in anglophone schools, warns head of association

Daily number of unfilled absences 'unsustainable,' says Connie Keating, calling for immediate action



Bobbi-Jean MacKinnon - CBC News -

Posted: Dec 02, 2022 7:00 AM AST | Last Updated: December 2, 2022



Connie Keating, president of the New Brunswick Teachers' Association, says unfilled absences are compromising the ability of teachers to do their work, and students are suffering. (CBC)

# WHY ARE WE TALKING ABOUT INDOOR AIR QUALITY NOW?

- “In the last several years, a growing body of scientific evidence has indicated that the air within homes and other buildings can be more seriously polluted than the outdoor air in even the largest and most industrialized cities.” (United States Environmental Protection Agency)
- “In addition, people who may be exposed to indoor air pollutants for the longest periods of time are often those most susceptible to the effects of indoor air pollution. Such groups include the young, the elderly and the chronically ill, especially those suffering from respiratory or cardiovascular disease.” (United States Environmental Protection Agency)

## Province's teachers work in overcrowded classrooms, face verbal, physical abuse: survey

Teachers' association calls on province to fix 'unacceptable' school issues



Hannah Rudderham - CBC News ·

Posted: Nov 14, 2023 1:25 PM AST | Last Updated: November 14, 2023



Peter Lagacy, the president of the New Brunswick Teachers' Association, said many teachers are facing unfair criticism 'fueled by comments from elected officials.' (Ed Hunter/CBC)

# WHAT REGULATIONS GOVERN IAQ?

- In New Brunswick workplaces:
  - Occupational Health & Safety Act
  - ASHRAE 62.1-2010: Ventilation for Acceptable Indoor Air Quality
- 2010 standard which specifies minimum volume of outdoor air supply required based on
  - Number of occupants, **AND**
  - Area of room

TABLE 6-1 MINIMUM VENTILATION RATES IN BREATHING ZONE  
(This table is not valid in isolation; it must be used in conjunction with the accompanying notes.)

Occupancy Category	People Outdoor Air Rate $R_p$		Area Outdoor Air Rate $R_a$		Notes	Default Values		Air Class	
	cfm/person	L/s-person	cfm/ft <sup>2</sup>	L/s-m <sup>2</sup>		Occupant Density (see Note 4)	Combined Outdoor Air Rate (see Note 5)		
						#/1000 ft <sup>2</sup> or #/100 m <sup>2</sup>	cfm/person L/s-person		
<b>Educational Facilities</b>									
Daycare (through age 4)	10	5	0.18	0.9		25	17	8.6	2
Daycare sickroom	10	5	0.18	0.9		25	17	8.6	3
Classrooms (ages 5–8)	10	5	0.12	0.6		25	15	7.4	1
Classrooms (age 9 plus)	10	5	0.12	0.6		35	13	6.7	1
Lecture classroom	7.5	3.8	0.06	0.3		65	8	4.3	1
Lecture hall (fixed seats)	7.5	3.8	0.06	0.3		150	8	4.0	1
Art classroom	10	5	0.18	0.9		20	19	9.5	2
Science laboratories	10	5	0.18	0.9		25	17	8.6	2
University/college laboratories	10	5	0.18	0.9		25	17	8.6	2
Wood/metal shop	10	5	0.18	0.9		20	19	9.5	2
Computer lab	10	5	0.12	0.6		25	15	7.4	1
Media center	10	5	0.12	0.6	A	25	15	7.4	1
Music/theater/dance	10	5	0.06	0.3		35	12	5.9	1
Multi-use assembly	7.5	3.8	0.06	0.3		100	8	4.1	1

# WHAT REGULATIONS GOVERN IAQ?

- ASHRAE has updated their guidance in 2013, 2016, 2019, and 2022. New Brunswick still uses 2010.
- ASHRAE published **Standard 241, Control of Infectious Aerosols** in 2023. It sets the new standard for keeping folks safe.
- Guidelines:
  - School CO<sub>2</sub> from 600 – 660 PPM
  - Clean airflow of 20 L/s per person
  - Air Changes per Hour (ACH) of 6.7 – 9.3

Occupancy Category	Equivalent Clean Airflow (lps/person)	Calculated Equivalent Air Changes per Hour	Calculated Equivalent CO2 (ppm)
Correctional Cell	15	5	710
Correctional Dayroom	20	8	660
Restaurant	30	28	600
Cafeteria	30	40	600
Gym	40	3.7	770
Office	15	1	790
Call Center	15	12	790
Retail	20	4	850
Transportation Waiting	30	40	600
Daycare	20	6.7	620
Elementary School	20	6.7	600
High School	20	9.3	660
Lecture Hall	25	50	620
Manufacturing	25	2.3	770
Sorting, packaging, light assembly	10	0.9	1300
Warehouse	10	0.1	1300
Health Care Exam Room	20	5.3	700
Health Care Group Treatment Area	35	9.3	580
Health Care Patient Room	35	9.3	550
Health Care Resident Room	25	5.3	600
Health Care Waiting Room	45	30	540
Auditorium	25	50	620
Place of Religious Worship	25	40	620
Museum	30	16	700
Convention	30	60	600
Spectator Area	25	50	640
Lobbies	25	50	760
Residential Common Space	25	0.7-5	620
Residential Dwelling Unit	15	0.4-3	710

# MOTION 36

- In June, Motion 36 was unanimously passed in the New Brunswick Legislature. It called on the government to:
  - modernize NB's air quality laws
  - bring forward a plan to monitor, report, and improve air quality systems in public buildings like hospitals, schools, and government buildings
  - mitigate the risks associated with the transfer of airborne illnesses
  - ensure improved air quality in these buildings for patients, healthcare workers, students, educators, employees, and all who enter these buildings.
- It is non-binding. We have not yet seen the vote turn into actions.



Ryan Murphy  
@Cyber\_Murphy



“BE IT THEREFORE RESOLVED the Legislative Assembly urge the government to modernize New Brunswick’s air quality laws and standards with a goal of bringing forward a strengthened Clean Air Act and modernized regulations.



1:03 PM · Mar 29, 2023 · 201.3K Views

# TESTING & REPORTING

What does EECD check?

What doesn't EECD check?

What does EECD tell us?



# HOW DOES EECD TEST AIR QUALITY?

- “The first air quality tests were conducted in the 2020-2021 school year, under the conditions most likely to create a CO<sub>2</sub> buildup: while classrooms were occupied during the winter heating season.”
- “Follow-up testing is completed annually during the same conditions in schools that are in need of integrated mechanical ventilation systems, and had previous peak CO<sub>2</sub> levels above 1,500 ppm.”



About Air Quality Testing and Ventilation Upgrades

<https://www2.gnb.ca/content/gnb/en/departments/education/k12/content/safe-buildings-optimal-learning/about-air-quality-testing.html>

# 2020 – 2021: 60 SCHOOLS

## Air Quality Test Results

SCHOOL DISTRICTS SUMMARY | 2020-2021



District	School	School Peak	School Average
ASD-E	Beaverbrook School	1992	1052
ASD-E	Bessborough School	2596	1403
ASD-E	Birchmount School	2695	1289
ASD-E	Dorchester Consolidated School	1653	845
ASD-E	Forest Glen School	2403	1191
ASD-E	Frank L. Bowser School	2350	1181
ASD-E	Hillcrest School	1889	845
ASD-E	Hillsborough Elementary School	2580	1407
ASD-E	Marshview Middle School	1953	672
ASD-E	Mountain View School	2089	1115
ASD-E	Riverside Consolidated School	576	479
ASD-E	Sunny Brae Middle School	1401	706
ASD-E	West Riverview School	1795	912
ASD-N	Harcourt School	1398	996
ASD-N	Jacquet River School	1392	701
ASD-N	Lord Beaverbrook School	3319	1112
ASD-N	Napan Elementary School	1546	934
ASD-S	Back Bay Elementary School	2055	1251
ASD-S	Barnhill Memorial School	2580	1095
ASD-S	Bayview School (FRMR SMS)	1081	617
ASD-S	Beaconsfield Middle School	2224	895
ASD-S	Centennial School	2337	977
ASD-S	Grand Bay Primary School	1322	886
ASD-S	Hazen-White-St. Francis School	2136	958
ASD-S	Inglewood School	2841	1159
ASD-S	Lawrence Station Elementary School	1603	1041
ASD-S	Norton Elementary School	2806	1668

ASD-S	Prince Charles School	1104	603
ASD-S	Princess Elizabeth School	1830	817
ASD-S	Sir James Dunn Academy	1645	766
ASD-S	St. John the Baptist/King Edward School	2361	1044
ASD-S	St. Stephen Elementary School	1224	895
ASD-S	White Head Elementary School	1149	864
ASD-W	Assiniboine Ave Elementary School	1505	791
ASD-W	Bath Community School	1720	1157
ASD-W	Bristol Elementary School	1198	692
ASD-W	Burton Elementary School	2186	1541
ASD-W	Chipman Elementary School	2477	1058
ASD-W	Connaught Street School	2447	1194
ASD-W	Donald Fraser Memorial School	2191	967
ASD-W	Florenceville Elementary School	2352	1286
ASD-W	Florenceville Middle School	2377	682
ASD-W	Forest Hill School	1927	1182
ASD-W	Gagetown School	1805	1027
ASD-W	Garden Creek School	1641	1024
ASD-W	George Street Middle School	4406	1403
ASD-W	Gesner Street Elementary School	1232	848
ASD-W	Harold Peterson Middle School	2227	1026
ASD-W	Harvey Elementary School	1903	1258
ASD-W	Keswick Ridge School	1887	1054
ASD-W	Kingsclear Consolidated	1443	748
ASD-W	McAdam Avenue School	1982	1082
ASD-W	Montgomery Street School	1781	1338
ASD-W	Nackawic Senior High School	1646	804
ASD-W	Nashwaaksis Memorial School	1934	1077
ASD-W	Old Arc-en-ciel School	1890	1061
ASD-W	Upper Miramichi Elementary School	2050	941
DSF-NE	Académie Assomption	934	582
DSF-S	École Blanche-Bourgeois	3047	1536
DSF-S	École Calixte-F.-Savoie	2478	1189

# 2021 – 2022: 51 SCHOOLS

## Air Quality Test Results

SCHOOL DISTRICTS SUMMARY | 2021-2022



District	School	School Peak	School Average
ASD-E	Beaverbrook School	1399	722.6
ASD-E	Bessborough School	3186	1384.9
ASD-E	Birchmount School	1809	857.9
ASD-E	Dorchester Consolidated School	2916	1074.4
ASD-E	Forest Glen School	2046	1160.1
ASD-E	Frank L. Bowser School	2041	1130.1
ASD-E	Hillcrest School	1552	846.7
ASD-E	Hillsborough Elementary School	1355	633.7
ASD-E	Marshview Middle School	3914	1239.1
ASD-E	Mountain View School	1552	849.2
ASD-E	West Riverview School	1539	735.8
ASD-N	Lord Beaverbrook Elementary School	2107	1509.8
ASD-N	Napan Elementary School	1548	631.4
ASD-S	Back Bay Elementary School	1353	733.6
ASD-S	Barnhill Memorial School	2344	1285.1
ASD-S	Beaconsfield Middle School	467	415.7
ASD-S	Blacks Harbour School	1834	813.2
ASD-S	Centennial School	1731	943.7
ASD-S	Hazen White School	2114	1066.5
ASD-S	Inglewood School	1812	1236.7
ASD-S	Sir James Dunn Academy	1993	1122.0
ASD-S	Lawrence Station Elementary School	755	633.8
ASD-S	Loch Lemond School	1266	665.2

ASD-S	Norton Elementary School	2493	1799.9
ASD-S	Princess Elizabeth School	392	371.4
ASD-S	St. John the Baptist/King Edward School	1351	898.5
ASD-S	St George School	1746	942.3
ASD-W	Assiniboine Ave Elementary School	994	704.8
ASD-W	Bath Community School	1801	1108.8
ASD-W	Burton Elementary School	1435	983.0
ASD-W	Chipman Elementary School	1450	965.6
ASD-W	Connaught Street School	2784	1346.7
ASD-W	Donald Fraser Memorial School	2155	986.5
ASD-W	Florenceville Elementary School	1865	1146.3
ASD-W	Florenceville Middle School	2873	725.1
ASD-W	Forest Hill Elementary School	1637	1027.1
ASD-W	Gagetown School	1395	913.4
ASD-W	Garden Creek School	1500	1054.3
ASD-W	George Street Middle School	2810	1422.1
ASD-W	Harold Peterson Middle School	2525	1058.6
ASD-W	Harvey Elementary School	1658	1086.6
ASD-W	Hubbard Elementary School	1530	915.3
ASD-W	Keswick Ridge School	2366	1302.4
ASD-W	McAdam Avenue Elementary School	983	638.7
ASD-W	Montgomery Street School	1824	947.2
ASD-W	Nackawic Senior High School	2345	1017.3
ASD-W	Nashwaaksis Memorial School	2044	1208.4
ASD-W	Ridgeview Middle School	1692	942.7
ASD-W	Upper Miramichi Elementary School	1415	853.3
DSF-S	École Blanche-Bourgeois	1538	787.7
DSF-S	École Calixte-F.-Savoie	1615	975.7

# 2022 – 2023: 35 SCHOOLS

## Air Quality Test Results

SCHOOL DISTRICTS SUMMARY | 2022-2023



District	School	School Peak	School Average
ASD-E	Bessborough School	2966	1128
ASD-E	Birchmount School	3119	1283
ASD-E	Dorchester Consolidated School	1669	957
ASD-E	Forest Glen School	886	629
ASD-E	Frank L. Bowser School	1779	1070
ASD-E	Hillcrest School	2202	978
ASD-E	Marshview Middle School	1978	1028
ASD-E	Mountain View School	2393	1494
ASD-E	West Riverview School	2339	1127
ASD-N	Napan Elementary School	892	745
ASD-S	Barnhill Memorial School	2696	920
ASD-S	Blacks Harbour School	2741	955
ASD-S	Centennial School	1816	922
ASD-S	Hazen White School	1994	735
ASD-S	Inglewood School	1064	621
ASD-S	Sir James Dunn Academy	1666	891
ASD-S	Norton Elementary School	902	623
ASD-S	St George School	1848	989
ASD-S	St Rose School	1636	787
ASD-W	Connaught Street School	973	753
ASD-W	Donald Fraser Memorial School	2011	1140
ASD-W	Florenceville Elementary School	1999	1157
ASD-W	Florenceville Middle School	2441	1015

ASD-W	Forest Hill Elementary School	1619	1110
ASD-W	George Street Middle School	3418	1709
ASD-W	Harold Peterson Middle School	2662	1182
ASD-W	Harvey Elementary School	2239	1415
ASD-W	Hubbard Elementary School	1616	936
ASD-W	Keswick Ridge School	2801	1450
ASD-W	Montgomery Street School	1510	1044
ASD-W	Nackawic Senior High School	2664	1142
ASD-W	Nashwaaksis Memorial School	2551	1538
ASD-W	Ridgeview Middle School	2737	1065
DSF-S	École Blanche-Bourgeois	1122	652
DSF-S	École Calixte-F.-Savoie	2484	1120

# WHAT DOESN'T EECDC CHECK?

- Any school with a mechanical ventilation system (they don't check if they work)
- Any school without a mechanical ventilation system that has previously obtained a single result below the 1500 PPM threshold (they don't check if it's still "safe")
- Any school more than once a year (that don't check if results are consistent)
- All classrooms in a tested school
- The validity of results (they don't check if posted results are scientifically possible)

District	School	School Peak	School Average
ASD-S	Beaconsfield Middle School	467	415.7
ASD-S	Princess Elizabeth School	392	371.4

# WHAT DOES EECD TELL US?

- “WorkSafeNB guidance indicates CO<sub>2</sub> levels below 5,000 ppm over an eight-hour period weighted average, or 30,000 ppm over a 15-minute weighted average do not pose risks to occupants’ health and safety.”

- 5,000 PPM is the **Threshold Limit Value** for CO<sub>2</sub> exposure. At this value:
  - 12.1% of the air is rebreathed
  - 1 in 8 breaths came from inside other people’s lungs

# WHAT DOES EECD TELL US?

- “WorkSafeNB guidance indicates CO<sub>2</sub> levels below 5,000 ppm over an eight-hour period weighted average, or 30,000 ppm over a 15-minute weighted average do not pose risks to occupants’ health and safety.”

- 30,000 PPM is the **Short-term Exposure Limit** for CO<sub>2</sub> exposure. At this value:
  - ~75% of the air is rebreathed
  - 3 in 4 breaths came from inside other people’s lungs

# WHAT DOES EECD TELL US?

- "Testing completed so far has not indicated an immediate danger to occupants," [...] The department has previously described CO<sub>2</sub> levels above 1,500 ppm as "less than optimal for learning." (Morgan Bell, EECD spokesperson)
- In New Brunswick, Bell said 1,500 ppm "was identified as the peak desirable CO<sub>2</sub> readings for schools," in consultation with WorkSafeNB and the Department of Transportation and Infrastructure. "CO<sub>2</sub> exposure does not pose a health risk unless the exposure is at a level of 5,000 ppm over an eight-hour period weighted average or 30,000 ppm over a [15]-minute period weighted average," she said in an emailed statement.
- "Personally, I think the best ventilation is an open window, but that's just a personal thought." (Minister Bill Hogan)



# LIMITATIONS OF THE 1500 PPM THRESHOLD

- Developed by WorkSafeNB as a:

*“rule of thumb to judge acceptability of ventilation for most work settings. We [WorkSafeNB] do recognise the limitations of this approach, and hence added notes. These remind readers that **CO<sub>2</sub> levels are only one factor in the assessment of ventilation systems** and that mechanical ventilation systems must adhere to 62.1-2010.”*

- Does not consider current standards, guidance, and best practice from relevant organizations (ASHRAE 62.1-2022, ASHRAE 241) developed after 2010
- **Does not consider the existence of children in schools:**

*“Different ages of occupants have not been considered in our guidance. This is a result of our jurisdiction: As WorkSafeNB, our mandate is limited to employees in New Brunswick. Unfortunately, students do not fall under our jurisdiction.”*

# MECHANICAL VENTILATION

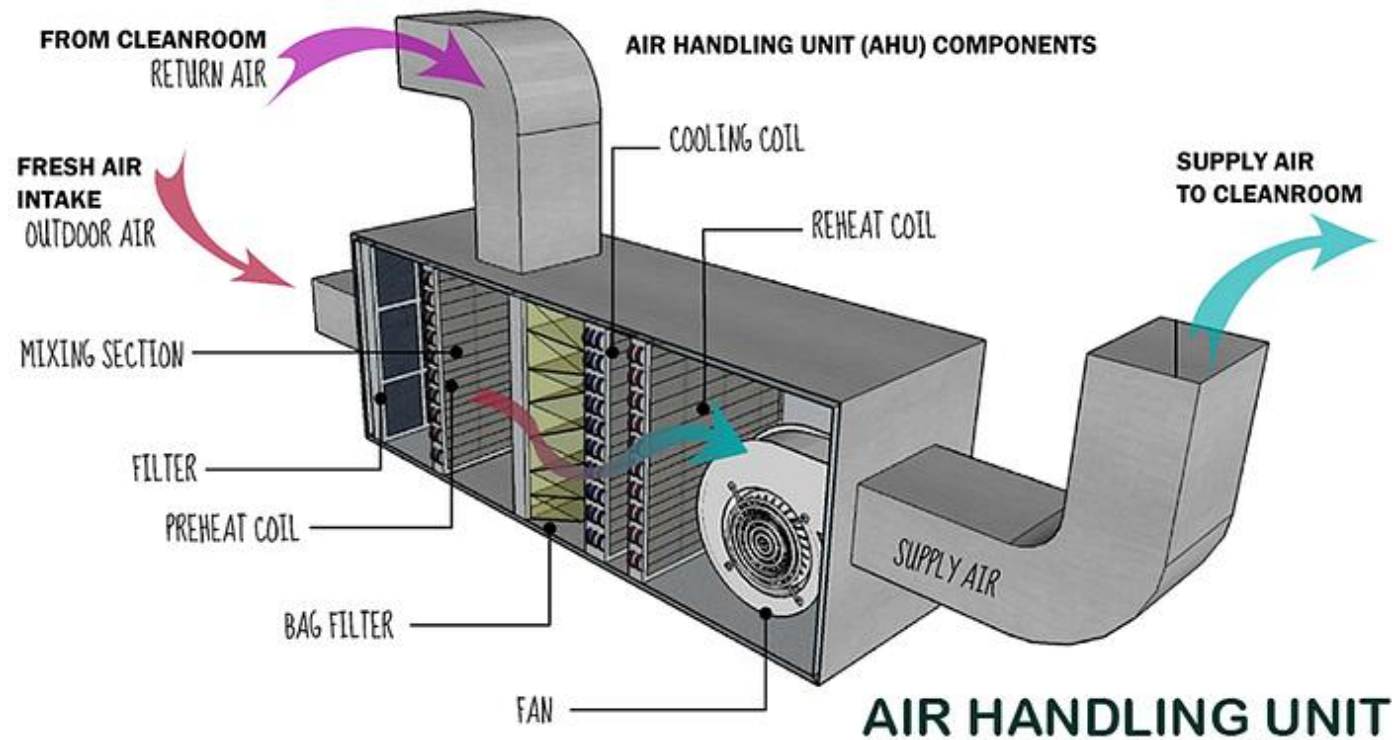
How does it work?

Why does it exist?

When does it work?

# WHAT DO VENTILATION SYSTEMS DO?

- “Ventilation is the process of moving air into and out of a space and typically refers to supplying outdoor air.” (Joey Fox, P.Eng – “Intro to Ventilation”)



# WHY DO WE NEED THEM?

- “The air quality inside buildings can be poor because of harmful airborne pollutants, which can have negative impacts on the health and comfort of occupants.”
- “The most straightforward way to reduce indoor pollutant concentrations is by exhausting indoor air and replacing it with outdoor air.”



It's Airborne: Intro to Ventilation

<https://itsairborne.com/intro-to-ventilation-8e87382b950b>

# WHEN DO THEY WORK?

- In New Brunswick, mechanical ventilation systems in schools are programmed by the Department of Transportation and Infrastructure.
- The hours those systems run varies between schools.
- From DTI:
  - “...ventilation systems are set to standard no flow [...] as the buildings are unoccupied.”
  - “In this case ‘unoccupied’ is defined as anytime outside of regular working hours.”

# WHEN DO THEY WORK?



# WHEN DO THEY WORK?

Average Hours	10.3
GNB Offices	14.0
District Offices	12.0
Schools	9.7
Schools (ASD)	9.3
Schools (DSF)	11.0

# WHEN DO THEY WORK?

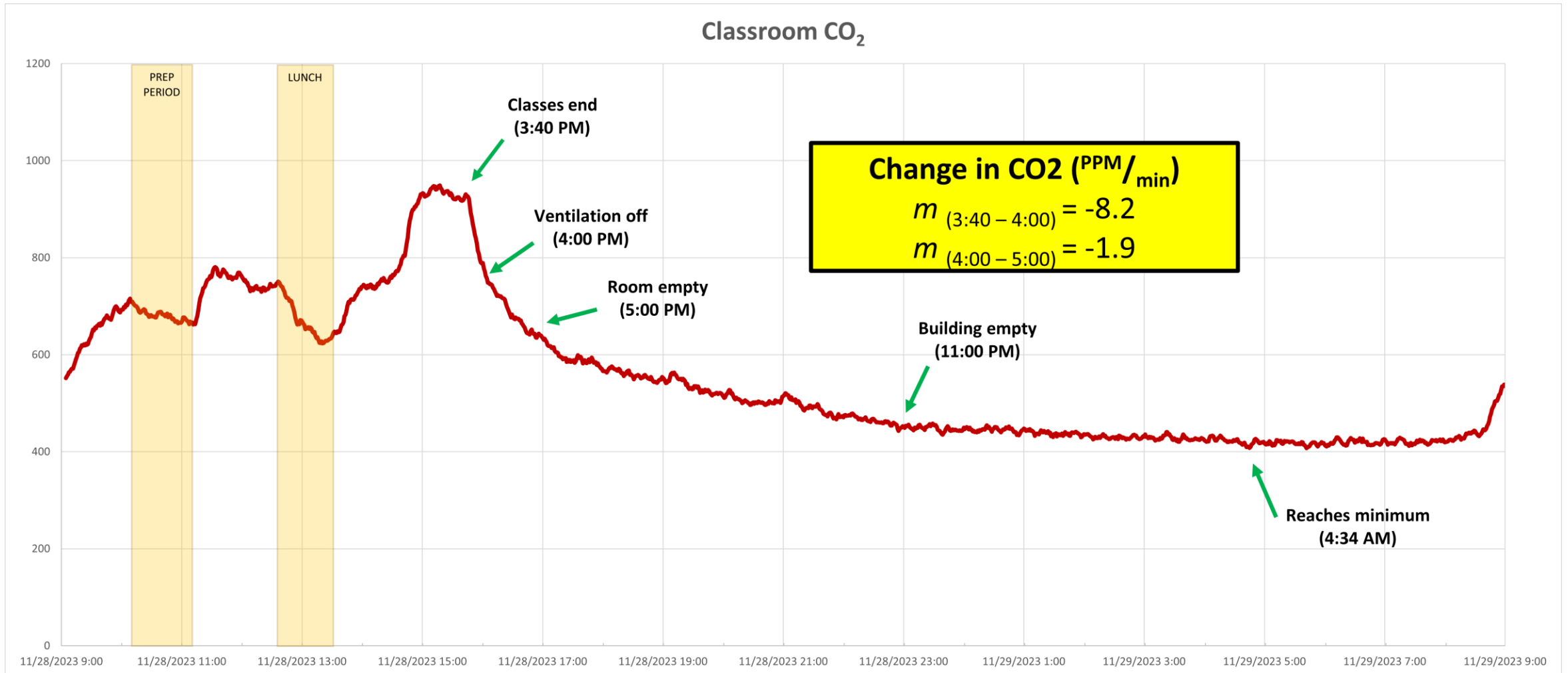
These schools are among the  
buildings considered  
“unoccupied” after 4:00 PM

Devon Middle School
Dr A.T. Leatherbarrow Primary School
<b>Fredericton High School</b>
Hampton Elementary School
Hanwell Park Academy
<b>Harrison Trimble High School</b>
Lakefield Elementary
<b>Moncton High School</b>
Nelson Rural School
Petitcodiac Regional School
Quispamsis Elementary School
Quispamsis Middle School
Salem Elementary School
Seaside Park School
<b>St. Malachy's Memorial High School</b>
St. Rose School



# WHEN DO THEY WORK?

Classroom CO<sub>2</sub>



# IMPROVING AIR QUALITY

What free things can we do now?

What things could EECD be doing now?

# WHAT CAN WE DO? (FREE)



## Windows

- Open windows as much as possible.
- If it's cold outside, even cracking windows slightly can help.
- Keeping the classroom door open helps circulate the air even more.
- Warm weather? Having 2 windows open while using a fan to blow air out of 1 of the windows is optimal.

# WHAT CAN WE DO? (FREE)

## Air Movement

Check to see if you feel air coming from the diffusers or air vents.



Attach a ribbon to the vent for an easy visual cue that it's working!

## Thermostat

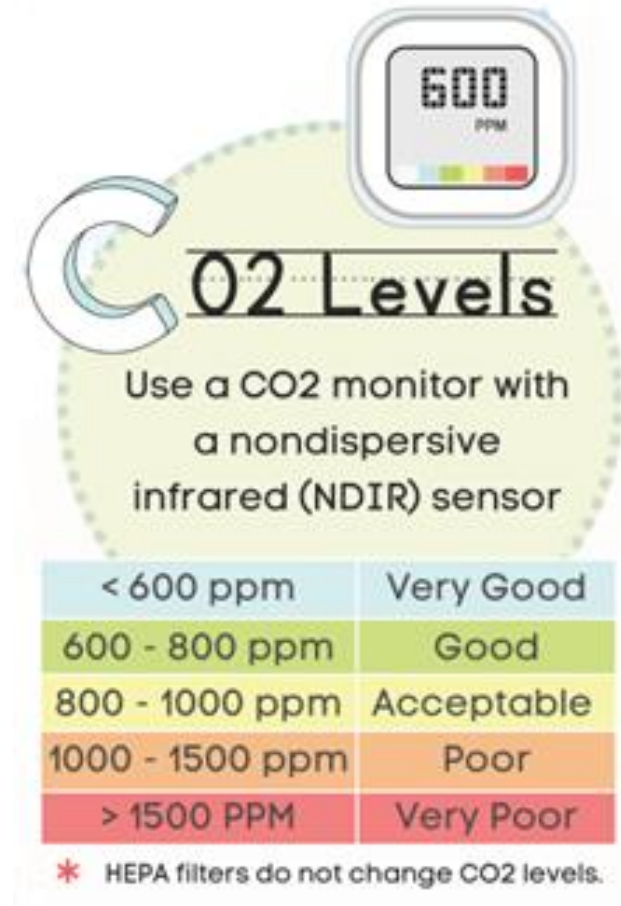
Keep the **FAN** setting **ON** when the room is being **occupied**.



**AUTO** is **ok** to use when the room is going to be **unoccupied**.

# WHAT CAN WE DO? (SOMETIMES FREE)

- Monitor CO<sub>2</sub> for cues to open windows or problems with mechanical ventilation systems
- CAVI: CO<sub>2</sub> Monitors for Public Libraries
  - N.B. Public Libraries have not yet agreed to participate
- Donate A Mask: Request program for teachers



# WHAT IS EECD DOING?

- Added portable HEPA filtration units to all classrooms without mechanical ventilation systems
- Installing mechanical ventilation systems in schools (~10 per year)

## 60 schools lacking ventilation systems now have HEPA filters to help combat COVID

47 of the schools tested high for carbon dioxide - almost double the number the province reported last fall

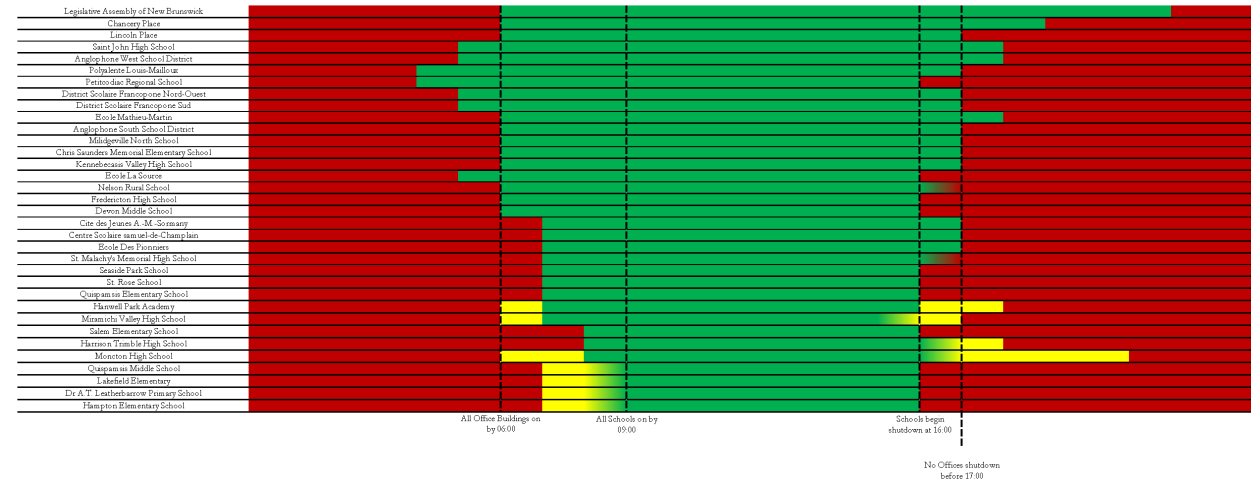
[Bobbi-Jean MacKinnon](#) - CBC News - Posted: Feb 01, 2022 7:52 PM AST | Last Updated: February 1, 2022



Students resumed in-person learning this week, as 60 of New Brunswick's 294 schools still don't have adequate ventilation systems. (Paul Chiasson/The Canadian Press)

# WHAT COULD EECD BE DOING?

- Running mechanical ventilation systems while buildings are *actually* occupied



# WHAT COULD EECDD BE DOING?

- Adding HEPA filtration to all occupied spaces in all schools, as recommended in the Employer's own report on the subject
  - This report is often cited to parents and staff as the reason they cannot donate HEPA devices to schools. That interpretation requires a *very* selective reading of the report.



SCIENCE & ENGINEERING • SCIENCE ET INGÉNIERIE

**Recommendations on the Use of Portable Air Filtration Systems  
in New Brunswick Classrooms: A COVID-19 Focus**

Prepared for:

Education Facilities and Pupil Transportation  
Department of Education and Early Childhood Development  
Attention: Josh Nowlan  
Place 2000  
P. O. Box 6000  
Fredericton, NB  
E3B 5H1



# THE SECTION EECDC CITES:

*Recommendations on the Use of Portable Air Filtration Systems  
in New Brunswick Classrooms: A COVID-19 Focus*

*Reference No. ADM-J10063  
Page 6*

**Question 2:** *NB has 294 public schools of which 234 have some form of integrated mechanical ventilation system. In general, is the response in 1) different for schools which do have some form of integrated ventilation system where fresh air is mechanically drawn in, circulated, and exhausted?*

**Answer:** For spaces with adequate mechanical ventilation systems, the use of portable air filters is not recommended. In our opinion, use of HEPA air filtration units should first be considered for spaces that do not have any form of integrated mechanical ventilation system. On a case-by-case basis, where mechanical ventilation systems are deemed to be insufficient and natural ventilation is not feasible, deploying portable air filtration systems should also be considered.

# THE OTHER CITATIONS IN THEIR REPORT:

**Rationale:** Our assessment of the need for portable air filtration units in schools with integrated mechanical ventilation systems was based on the following scientific evidence found in the literature:

Mechanical ventilation systems can vary greatly in configuration [17], but if they are bringing in sufficient fresh air, this can help to dilute airborne contaminants in classrooms. Some systems may have filters in place as well, which can further reduce aerosols in the air.

Schools with some form of integrated mechanical ventilation can also take advantage of natural ventilation (e.g. opening windows) if feasible. On a case-by-case basis, where mechanical ventilation systems are deemed to be insufficient and natural ventilation is not feasible, deploying portable air filtration systems should be considered.

# THE OTHER CITATIONS IN THEIR REPORT;

**Rationale:** Our assessment of portable air filtration units can play a role in providing additional protection from COVID-19. Some examples are provided below.

Public Health Agency of Canada on portable air filters [1]:  
“When properly used, portable air filtration devices with high-efficiency particulate air (HEPA) filters have been shown to reduce the concentration of some viruses from the air. The use of these devices could be considered as an additional protection in situations where enhancing natural or mechanical ventilation is not possible and when physical distancing can [sic] be achieved.”

on units in schools with integrated scientific evidence found in the

figuration [17], but if they are the airborne contaminants in

... some form of integrated mechanical ventilation can also take advantage of natural ventilation (e.g. opening windows) if feasible. On a case-by-case basis, where mechanical ventilation systems are deemed to be insufficient and natural ventilation is not feasible, deploying portable air filtration systems should be considered.



# THE OTHER CITATIONS IN THEIR REPORT;

**Rationale:** Our assessment of portable air filtration units can play a role in providing additional protection from COVID-19. Some examples are provided below.

Public Health Agency of Canada on portable air filters [27]:

“When properly used, portable air filtration units with high-efficiency particulate air (HEPA) filters have been shown to reduce the concentration of some viruses from the air. The use of HEPA filters as an additional protection in situations where natural ventilation is not possible and when mechanical ventilation systems are deemed to be insufficient, deploying portable air filtration systems should be considered for spaces that do not have any form of integrated mechanical ventilation on units in schools with integrated mechanical ventilation.”

World Health Organization statement on portable air filters from December 23, 2020 [17], but if they are used in schools with integrated mechanical ventilation, they can help to reduce the concentration of the COVID-19 virus in the air, thus reducing the possibility of transmission. A MERV14/ISO 4 ePM1 70-80% air filter can improve air quality when used in indoor settings.”



# THE OTHER RECOMMENDATIONS IN THEIR

United States Centers for Disease Control and Prevention on portable air filters in schools and childcare programs [28]:

“Opening windows, using portable air cleaners, and improving building filtration are ways you can increase ventilation in your school or childcare program.”

World Health Organization statement on portable air filtration [27]:

“Air filters do not provide ventilation and do not replace other ventilation methods. However, they can help to reduce the concentration of the COVID-19 virus in the air, thus reducing the possibility of transmission. A MERV14/ISO ePM1 70-80% air filter can improve air quality when used in indoor settings.”

**Rationale:** Our assessment of mechanical ventilation literature and public health authorities recognize that portable air filtration provides additional protection from COVID-19. Some examples are provided by the Public Health Agency of Canada on portable air filters:

“When properly used, portable air filters can help to reduce the concentration of particulate air (HEPA) filters have been shown to reduce the concentration of some viruses from the air. The use of portable air filtration provides additional protection in situations where natural ventilation is not possible and when mechanical ventilation is not feasible.”

When natural ventilation (e.g. opening windows) is not possible and mechanical ventilation systems are deemed to be insufficient, portable air filtration systems should be considered for spaces that do not have any form of integrated mechanical ventilation.



# THE OTHER RECOMMENDATIONS IN THEIR

**Rationale:** Our assessment

mechanical ventilation

authorities recognize that portable air filtration provides additional protection from COVID-19. Some examples are provided by the Public Health Agency of Canada on portable air filters [27]:

“When properly used, portable air filtration can remove particulate air (HEPA) filters have been shown to remove viruses from the air. The use of portable air filtration systems

United States Environmental Protection Agency on portable air filters in schools [4]:

“Consider using portable air cleaners to supplement increased HVAC system ventilation and filtration, especially in areas where adequate ventilation is difficult to achieve. Directing the airflow so that it does not blow directly from one person to another reduces the potential spread of droplets that may contain infectious viruses.”

United States Centers for Disease Control and Prevention on portable air filters in schools and childcare programs [28]:

“Opening windows, using portable air cleaners, and improving building filtration are ways you can increase ventilation in your school or childcare program.”

World Health Organization statement on [27]:

“Air filters do not

not replace other ventilation methods. The concentration of the COVID-19 virus is not reduced by portable air cleaners used in indoor settings.”

# THE OTH

United States  
Sch  
Recommendations on the Use of Portable Air Filtration Systems  
in New Brunswick Classrooms: A COVID-19 Focus



# EIR

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mecha

Is there evidence that HEPA filtration units reduce aerosol concentrations in a classroom?  
→ Yes.

A number of studies [5–8] have demonstrated that mobile air filtration units equipped with HEPA filters can effectively reduce aerosol concentrations of varying sizes in school classrooms. For example, Curtius et al. [5] showed that a homogeneous reduction in particles between 10 nm and 10 μm could be achieved with portable air filtration units. They also noted that in addition to potential reduction of COVID-19 transmission in classrooms, these units have the added benefit of improving overall air quality through reduction of particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>) in the spaces in which they operate. The World Health Organization (WHO) recommends that the average exposure levels to PM<sub>2.5</sub> should be below 10 mg/m<sup>3</sup>, as higher exposure increases the risks of a variety of

“...not replace other ventilation concentration of the COVID-19 transmission. A MERV14/ISO used in indoor settings.”

“...difficult to achieve. Directing the airflow so that it does not blow directly from one person to another reduces the potential spread of droplets that may contain infectious viruses.”

# WHAT COULD EECDC BE DOING?

- Allowing donations of HEPA devices from parents, staff, and community organizations
- Promoting the curricular and health benefits of STEM projects on air quality
  - Corsi-Rosenthal boxes (DIY air cleaner)
  - Measuring CO<sub>2</sub> and PM2.5 in classes

## Most N.B. schools that tested high for CO2 still lack proper ventilation, data reveals

No 'immediate danger,' says province, but epidemiologist calls results a 'public health crisis'



[Bobbi-Jean MacKinnon](#) · CBC News · Posted: Apr 14, 2023 8:12 AM ADT | Last Updated: April 14, 2023

Schools without a mechanical ventilation system continue to use portable air filtration devices with high-efficiency particulate air (HEPA) filters.

Schools cannot accept donations of HEPA systems, filters or homemade air purifier systems, known as [Corsi-Rosenthal boxes](#), Bell confirmed.

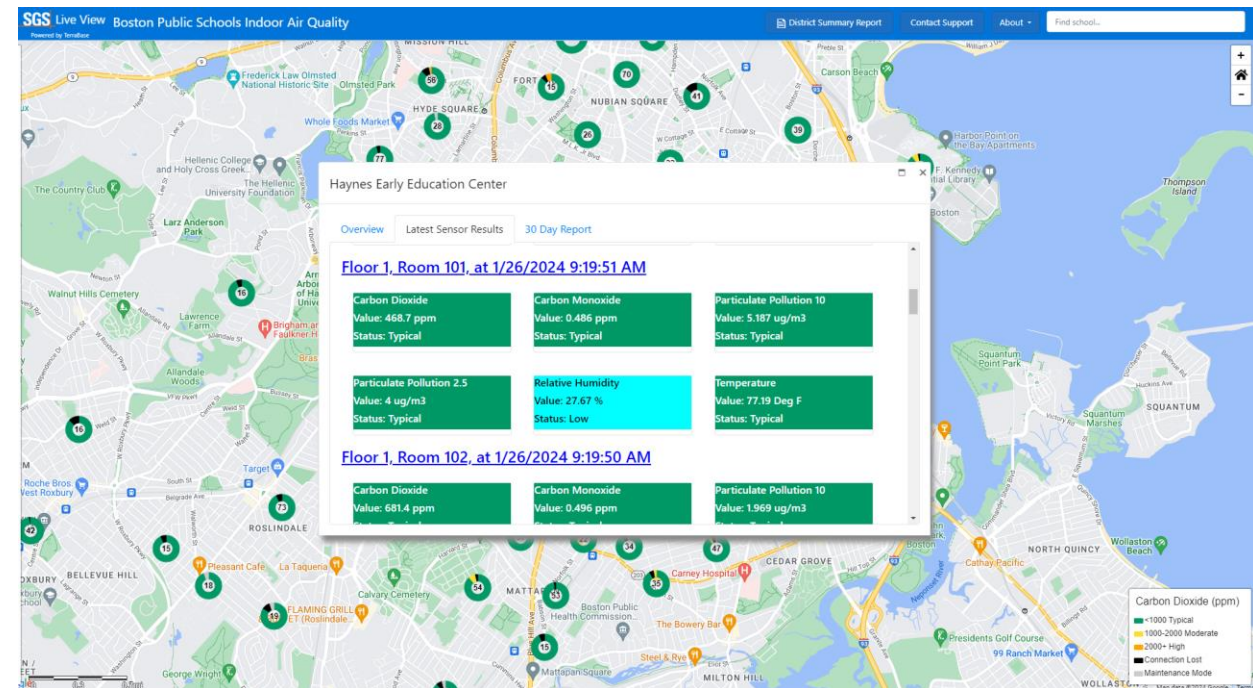
"Air purification systems are designed for the specific space and installed by professionals," she said.

Homemade equipment would not meet the strict safety standards, such as electrical, said Anglophone School District South spokesperson Jessica Hanlon.



# WHAT COULD EECD BE DOING?

- Providing real-time data on the air quality in schools
- Boston Public Schools installed 4400 sensors, with data available online, all the time, tracking:
  - Carbon dioxide
  - Carbon monoxide
  - PM 2.5 & PM 10
  - Temperature
  - Relative humidity
- EECD checks CO<sub>2</sub> in a few hundred rooms once a year, and reports those findings in a PDF months later.



# WHY DOES THIS MATTER?

What educational & health benefits are seen with improved air quality?

# IMPROVED MATH, READING, & SCIENCE SCORES

- Classroom ventilation rates were measured in 140 fifth grade US classrooms.
  - Mean mathematics scores increased by up to **0.5% per each liter per second per person** increase in ventilation rate, with similar effects on reading and science scores.

# IMPROVED COGNITIVE FUNCTION

- CO<sub>2</sub> concentrations were measured as a proxy for ventilation rates in classrooms.
  - Cognitive testing of students shows a 5% decrease in ‘power of attention’ in poorly ventilated classrooms.

**Researchers equate this to the effect of a student skipping breakfast.**

# IMPROVED TEST SCORES

- Ventilation renovations were completed to improve IAQ in all school buildings within a single Texas school district.
  - Math and reading test scores significantly improved, with an increased probability of passing by 2% and 3%, respectively.

# FEWER MISSED SCHOOL DAYS

- Increased ventilation rates and child sick days were studied for 635 children attending 20 daycare centers in Denmark.
  - A 12% decrease in sick days was found per hour increase in the air exchange rates.

# FEWER MISSED SCHOOL DAYS

- CO<sub>2</sub> as a proxy for ventilation was studied in 60 naturally ventilated primary school classrooms in Scotland.
  - For each 100 ppm increase in time average CO<sub>2</sub> concentration, student attendance decreased by about 0.4 days per year.

# FEWER MISSED SCHOOL DAYS

- CO<sub>2</sub> concentration was measured continuously over two years in 162 US primary school classrooms with a mixture of mechanical and natural ventilation.
  - For each 1 L/s (2.2 cfm) per occupant increase in ventilation rate, illness absence decreased 1.6%.

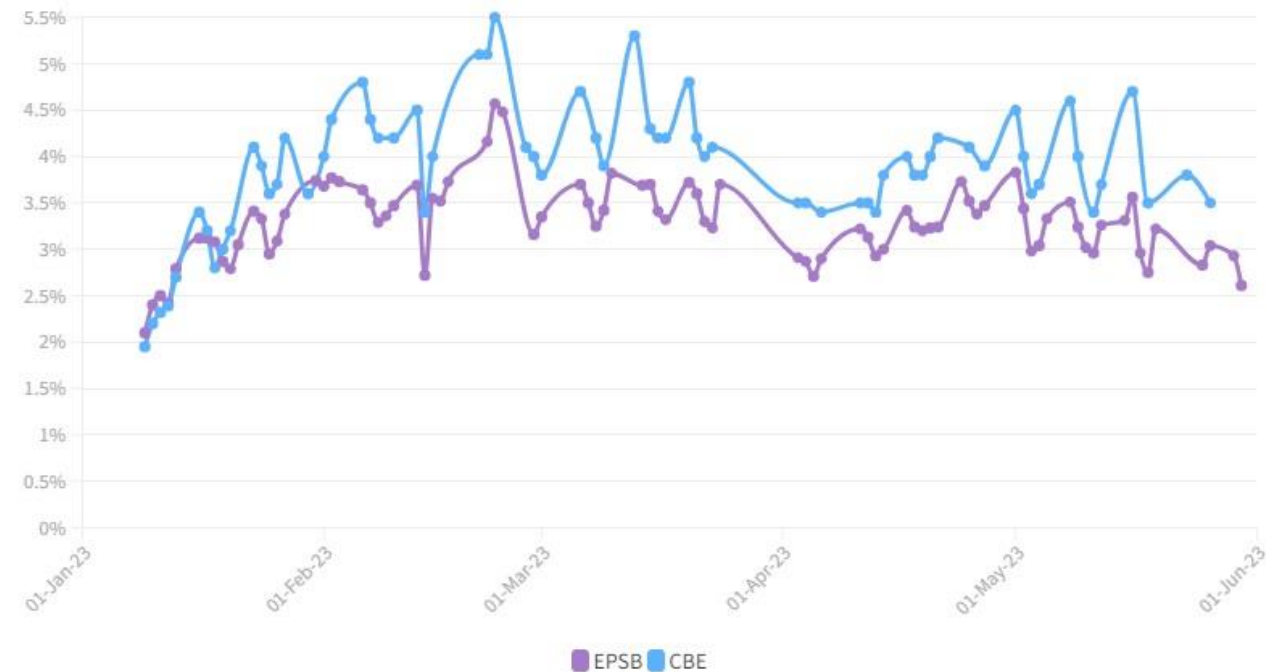


# FEWER MISSED SCHOOL DAYS

- Edmonton Public Schools have installed HEPA filters in every classroom.
- Calgary Board of Education has not, citing that their schools were already mechanically ventilated.
- From January to June 2023, Edmonton experienced 20% fewer absences due to illness

**Student absences from Edmonton Public Schools and Calgary Board of Education schools due to any illness (2023)**

Percentage of total student population absent on a daily basis. Data reflects student absences reported by parents.



Source: [Edmonton Public Schools](#), [Calgary Board of Education](#) • Graphic: Kyra Markov/CTV News Edmonton

# FEWER MISSED SCHOOL DAYS

- HEPA filters were added to UK schools in the first randomised trial
  - Reduction in Covid-19 related sick days by more than 20%

# HEALTHIER PEOPLE

- An Italian study of 10,000 classrooms
- Moving from natural ventilation to:
  - 2.4 ACH reduced infections by 40%
  - 4 ACH reduced infections by 66.8%
  - 6 ACH reduced infections by 82.5%

Table 1. Incidence cases (ICs), incidence proportions (IPs), and incidence proportion ratios (IPRs) observed in classrooms with and without mechanical ventilation systems (MVSs) during the periods of investigation.

Parameter	Period of investigation	Classrooms without MVS	Classrooms with MVS
Incidence cases, IC	13 Sept – 23 Dec 2021	1,272	18
	7–31 Jan 2022	1,818	13
	Entire period	3,090	31
Incidence proportion, IP (per 1000 students)	13 Sept – 23 Dec 2021	6.3	2.8
	7–31 Jan 2022	9.0	2.1
	Entire period	15.3	4.9
Incidence proportion ratio, IPR	13 Sept – 23 Dec 2021		0.45
	7–31 Jan 2022		0.23
	Entire period		0.32

# THIS ARTICLE WAS PUBLISHED THIS WEEK.

It says many of the same things, but from an Ontario perspective.

**a.** TVO Today | The Agenda  
@TheAgenda

...

Breathing room: Why parents and experts are calling for a clean-air revolution in schools [tvo.org/article/breath...](https://tvo.org/article/breath...) — by @SpichakSimon #onted



From [tvo.org](https://tvo.org)

# REFERENCES: BACKGROUND

- NBTA: Professional Conduct and Standards
- CBC: N.B. students missed 250,000 days in November, data shows
- FTB/FCT: Occupational Health and Safety Policy
- CBC: teacher shortage at 'crisis point' in anglophone schools, warns head of association
- United States EPA: The Inside Story: A Guide to Indoor Air Quality
- CBC: Province's teachers work in overcrowded classrooms, face verbal, physical abuse: survey

# REFERENCES: BACKGROUND

- Occupational Health & Safety Act
- ASHRAE: The Standards for Ventilation and Indoor Air Quality
- ASHRAE: ASHRAE Standard 241, Control of Infectious Aerosols
- Equivalent Clean Airflow Rates from ASHRAE 241 Control of Infectious Aerosols (Part 2)
- CBC: N.B. passes Opposition motion to improve air quality in public buildings

# REFERENCES: TESTING & REPORTING

- [EECD: About Air Quality Testing and Ventilation Upgrades](#)
- [EECD: Results Summary](#)
- [CBC: Most N.B. schools that testing high for CO2 still lack proper ventilation, data reveals](#)
- [CBC: 'As a parent, I would be concerned,' air quality expert sats of N.B. school results](#)
- [CCOHS: Carbon Dioxide](#)

# REFERENCES: VENTILATION

- [Joey Fox – It's Airborne: Intro to Ventilation](#)
- [Graphic: Air Handling Unit](#)



# REFERENCES: IMPROVING IAQ

- [How Can You Clean The Air? W.A.T.C.H](#)
- [CAVI: Canadian CO2 Monitor Expansion Program](#)
- [Donate A Mask: Request](#)
- [Boston Public Schools Indoor Air Quality](#)
- [CBC: 60 schools lacking ventilation systems now have HEPA filters to help combat COVID](#)
- [RPC: Recommendations on the Use of Portable Air Filtration Systems in New Brunswick Classrooms: A COVID-19 Focus](#)

# REFERENCES: IMPROVING IAQ

- [T. Lipinski, D. Ahmad, N. Serey, H. Jouhara, Review of ventilation strategies to reduce the risk of disease transmission in high occupancy buildings, Int. J. Thermofluids. 7–8 \(2020\) 100045](#)
- [Public Health Agency of Canada, COVID-19: Guidance on indoor ventilation during the pandemic, \(n.d.\)](#).
- [World Health Organization, Coronavirus disease \(COVID-19\): Ventilation and air conditioning, \(2021\)](#).
- [United States Environmental Protection Agency, Air Cleaners, HVAC Filters, and Coronavirus \(COVID-19\)](#)
- [Centers for Disease Control and Prevention, Ventilation in Schools and Childcare Programs, \(2021\)](#).
- [J. Curtius, M. Granzin, J. Schrod, Testing mobile air purifiers in a school classroom: Reducing the airborne transmission risk for SARS-CoV-2, Aerosol Sci. Technol. 55 \(2021\) 586–599](#).
- [S. Burgmann, U. Janoske, Transmission and reduction of aerosols in classrooms using air purifier systems, Phys. Fluids. 33 \(2021\) 1–11](#).
- [F.F. Duill, F. Schulz, A. Jain, L. Krieger, B. van Wachem, F. Beyrau, The impact of large mobile air purifiers on aerosol concentration in classrooms and the reduction of airborne transmission of SARS-CoV-2, Int. J. Environ. Res. Public Health. 18 \(2021\)](#)
- [W.G. Lindsley, R.C. Derk, J.P. Coyle, S.B. Martin, K.R. Mead, F.M. Blachere, et al., Efficacy of Portable Air Cleaners and Masking for Reducing Indoor Exposure to Simulated Exhaled SARS-CoV-2 Aerosols — United States, 2021, MMWR. Morb. Mortal. Wkly. Rep. 70 \(2021\) 972–976](#)

# REFERENCES: WHY?

- [Haverinen-Shaughnessy, U., & Shaughnessy, R. J. \(2015\). Effects of Classroom Ventilation Rate and Temperature on Students' Test Scores. PLOS ONE, 10\(8\), e0136165.](#)
- [Coley, D.A., Greeves, R., & Saxby, B.K. \(2007\). The effect of low ventilation rates on the cognitive function of a primary school class. International Journal of Ventilation, 6, 107-112.](#)
- [Stafford, T. M. \(2015\). Indoor air quality and academic performance. Journal of Environmental Economics and Management, 70, 34–50.](#)
- [Kolarik, B., Andersen, Z. J., Ibfelt, T., Engelund, E. H., Møller, E., & Bräuner, E. V. \(2016\). Ventilation in day care centers and sick leave among nursery children. Indoor Air, 26\(2\), 157–167.](#)
- [Gaihre, S., Semple, S., Miller, J., Fielding, S., & Turner, S. \(2014\). Classroom Carbon Dioxide Concentration, School Attendance, and Educational Attainment. Journal of School Health, 84\(9\), 569–574.](#)
- [Mendell, M. J., Eliseeva, E. A., Davies, M. M., Spears, M., Lobscheid, A., Fisk, W.J., & Apte, M. G. \(2013\). Association of classroom ventilation with reduced illness absence: A prospective study in California elementary schools. Indoor Air, 23\(6\), 515-528.](#)
- [Increasing ventilation reduces SARS-CoV-2 airborne transmission in schools: a retrospective cohort study in Italy's Marche region](#)