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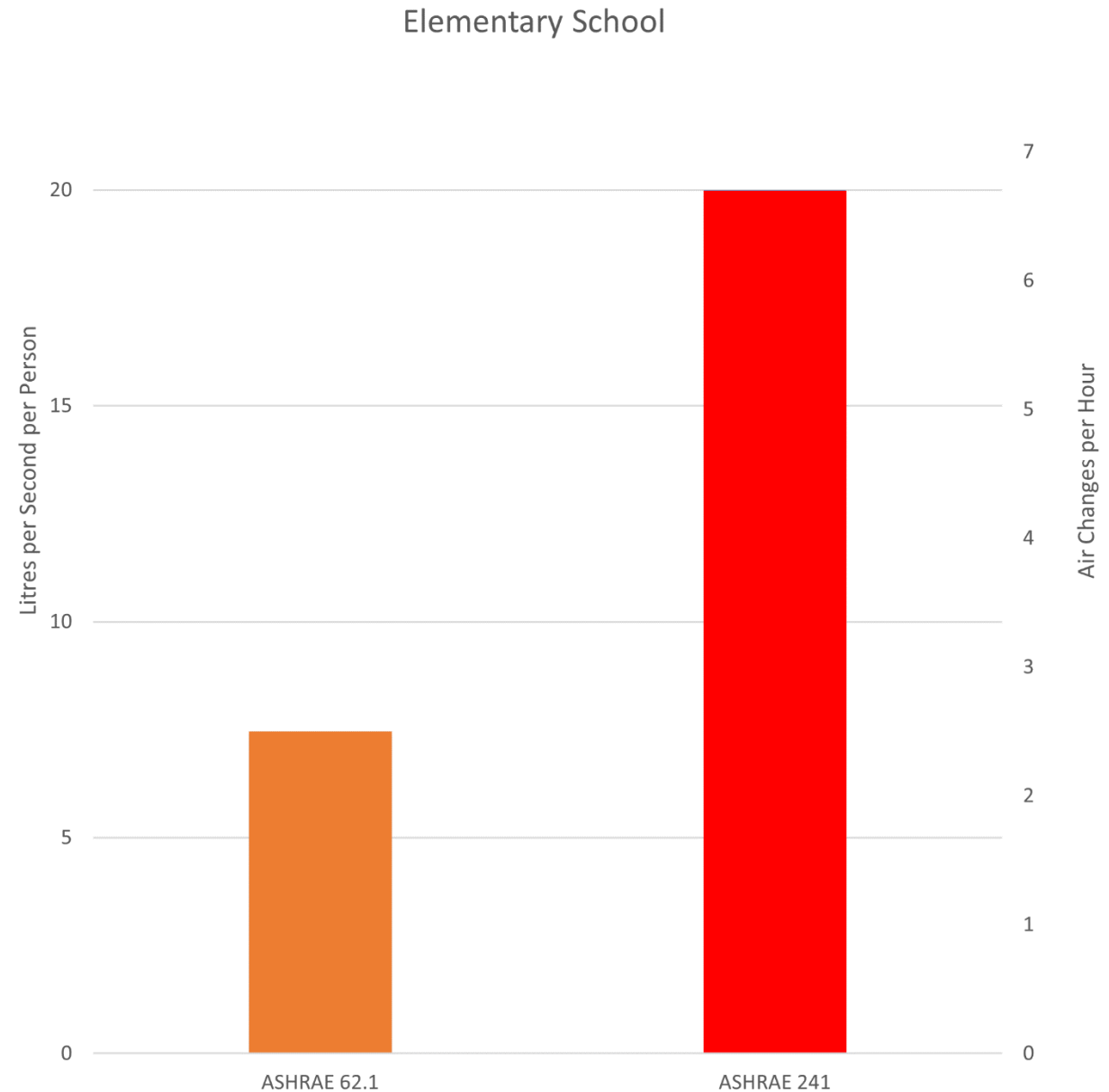
# Implementing ASHRAE 241 in Schools

OSPE Indoor Air Quality Advisory Group  
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## ASHRAE 241 – Control of Infectious Aerosols

- Current IAQ standards (ASHRAE 62.1) are not designed for airborne disease mitigation.
  - Comfort, off-gassing of materials
  - Primarily uses outdoor air - ventilation
  - Particulate matter, requires filtration, but not used
- ASHRAE 241 was developed to control infectious aerosols.
  - Use any method to provide equivalent clean air
  - 20 liters/second/person in classrooms
- Clean airflow rates in ASHRAE 241 are 2-10 x higher than ASHRAE 62.1



## Tools to Improve IAQ

- Ventilation: Supply outdoor air
- Filtration: Remove particles by passing them through a filter
- UV: Disinfect pathogens in the air. Can be effective, but the most effective methods to use UV – upper room UV and far-UV are currently not allowed in Canada
- Alternative air cleaners (ionization, photocatalytic oxidation, hydrogen peroxide, hydroxyl generators)
  - Not regulated. Not necessarily safe or effective. Avoid and disable.

## What School Boards Can Do

- Commission equipment and ensure it is running properly
- Increase the amount of outdoor air supplied to the space
  - Increase the percentage of outdoor air
  - Increase the total airflow to the space
- Upgrade filters to MERV-13
- Supplement with HEPA filters to achieve target rates
- Monitor air quality, especially CO<sub>2</sub>

# The First Four Healthy Building Strategies Every Building Should Pursue to Reduce Risk from COVID-19

JULY 2022



## Transparency & Disclosure

- CO<sub>2</sub> Monitoring
  - Assessing Risk of Airborne Diseases
  - Measuring outdoor airflow per person
  
- Building Readiness Plan
  - What measures are in place
  - How much clean air is provided per space
  - Need disclosure about commissioning: have the issues been found and fixed

CO <sub>2</sub> (ppm) Elementary	Outdoor Airflow/Person (lps/person)	Extra Clean Airflow Required (lps/person)
600	20	0
800	10	10
1000	7	13
1200	5	15
1500	4	16
2000	2.5	17.5

CO <sub>2</sub> (ppm) High School	Outdoor Airflow/Person (lps/person)	Extra Clean Airflow Required (lps/person)
650	20	0
800	12	8
1000	8	12
1200	6	14
1500	4	16
2000	3	17

## What Can Individuals Do?

- WATCH
- Windows – Open as much as possible, comfort permitting
- Air Movement – check airflow from diffusers
- Thermostat – fan should be ON when the space is occupied
- CO<sub>2</sub> – continually monitor CO<sub>2</sub> levels
- HEPA Filters – run as high as comfortable, noise permitting



- 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.

### 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**.

### CO<sub>2</sub> Levels

Use a CO<sub>2</sub> monitor with a nondispersive infrared (NDIR) sensor



< 600 ppm	Very Good
600 - 800 ppm	Good
800 - 1000 ppm	Acceptable
1000 - 1500 ppm	Poor
> 1500 PPM	Very Poor

\* HEPA filters do not change CO<sub>2</sub> levels.

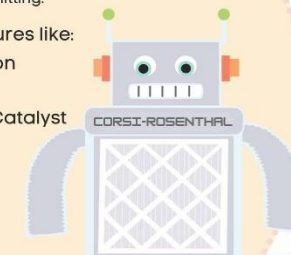
### HEPA Filter or Corsi-Rosenthal Box

Use the highest setting.  
\* Noise permitting.



Disable Features like:

- Ionization
- Plasma
- UV with Catalyst
- Auto



### PLACEMENT IS IMPORTANT

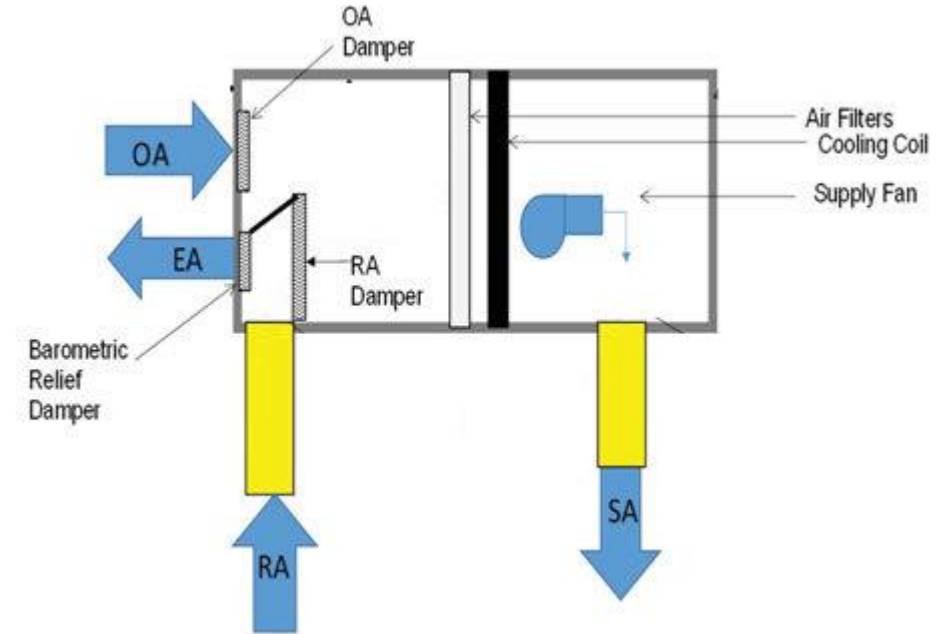
- Move away from walls & corners. (0.5 m - 1.5 ft)
- Place as close as you can to the centre of the room.
- Avoid blowing directly at anyone.
- Face away from walls & obstructions, e.g. blowing under a table.
- Raised is better than on the floor.
- Keep away from clean air sources: open windows, air vents & other HEPA filters.
- If you have multiple HEPA filters, space them out evenly.

## Summary of Tools

	HVAC/Building Wide	In-Room
<b>Ventilation</b>	<ul style="list-style-type: none"><li>➤ Increase outdoor airflow</li></ul>	<ul style="list-style-type: none"><li>➤ Thermostat Fan setting On</li><li>➤ Windows</li></ul>
<b>Filtration</b>	<ul style="list-style-type: none"><li>➤ Upgrade to MERV-13</li></ul>	<ul style="list-style-type: none"><li>➤ HEPA filter or CR Box</li></ul>
<b>Verification &amp; Transparency</b>	<ul style="list-style-type: none"><li>➤ Commission HVAC systems</li><li>➤ Building Readiness Plan</li></ul>	<ul style="list-style-type: none"><li>➤ Monitor CO<sub>2</sub></li><li>➤ Check airflow</li></ul>

## Example 1

- Classroom with 25 people: 20 liters/second/person x 25 = 500 liters/second
- Roof top unit supplying 500 liters/second, 30% outdoor air
  - 150 liters/second of outdoor air
  - 350 liters/second of recirculated air
- $150/25=6$  lps/person of outdoor air – Approximately 1100 ppm CO<sub>2</sub>
- Upgrade to MERV-13 filters (77% effective)
  - $350 * 0.77 = 270$  liters/second
- Total = 150 + 270 = 420 liters/second
- Find a HEPA filter that supplies 500-420 = 80 liters/second of clean air



Source: Lorenzo Cremaschi & Pedro Perez Paez (2017) Experimental feasibility study of a new load-based method of testing for light commercial unitary heating, ventilation, and air conditioning (ASHRAE RP-1608), Science and Technology for the Built Environment, 23:7, 1178-1188, DOI: 10.1080/23744731.2016.1274628



## Example 2

- Classroom with 20 people:  $20 \text{ liters/second/person} \times 20 = 400 \text{ liters/second}$
- No mechanical ventilation. Open window policy
- Monitor  $\text{CO}_2$  and find it is 1500 ppm =  $4 \text{ lps/person} \times 20 \text{ people} = 80 \text{ lps}$  of outdoor air
- Find HEPA filters to supply  $400 - 80 = 320 \text{ liters/second}$  of clean air

# Questions.

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