

# COVID-19: School Indoor Air Quality (IAQ) – Mechanical Ventilation in Schools

## Frequently Asked Questions & Resource Guide for School IAQ

*Disclaimer: This document is current as of Nov 23, 2020*

### **Q1. Can Heating, ventilation and air conditioning (HVAC) systems assist in the transmission of COVID-19?**

COVID-19 is primarily transmitted by respiratory droplets or aerosols carrying the virus. There is limited evidence that COVID-19 is transmitted via HVAC systems. Airborne transmission of COVID-19 may occur in circumstances such as<sup>1</sup>:

- Enclosed spaces where an infectious person may expose people at the same time or shortly after they have left the space.
- Prolonged exposure (>30 minutes) to respiratory particles (droplets or aerosols) especially when there is an increase in respiratory particles due to activities such as singing, yelling or exercising.
- Inadequate ventilation or air handling that allows a build-up of suspended small respiratory droplets and particles.

### **Q2: What is the difference between droplets and aerosols?**

Droplets and aerosols are both respiratory particles that are generated when an individual talks, coughs, sneezes, or breathes. COVID-19 transmission occurs when a person comes in close contact with respiratory droplets or aerosols containing the infectious virus<sup>1</sup>.

A droplet (aka respiratory droplet) is a large particle (greater than 5 microns) consisting mostly of water. Droplets evaporate quickly depending on relative humidity, air temperature and velocity and generally only travel a short distance (less than 1 meter)<sup>1</sup>.

Aerosols or aerosolized particles (less than 5 microns) can remain in the air for long periods of time and can travel further than droplets (further than 1 meter)<sup>1</sup>.

### **Q3: Can the recirculation of air through HVAC systems increase the risk of transmitting COVID-19?**

There is limited information currently available on the recirculation of air and COVID-19 transmission. Recirculation is the process of indoor air being drawn into the HVAC system, filtered and then exhausted back into the building. Classrooms with mechanical ventilation (HVAC) typically have about 20% of their air supplied from outdoors, and the rest is recirculated air<sup>2</sup>.

During the COVID-19 pandemic, outdoor ventilation rates should be increased to the maximum operational capacity of the building ventilation system and minimize recirculation of indoor air<sup>3</sup>.

The use of filters with a minimum efficiency reporting value of 13 (MERV 13) or greater are recommended to capture airborne virus particles. If MERV 13 or greater filters cannot be installed, [follow ASHRAE guidelines<sup>3</sup>](#).

**Q4: Are there guidelines to follow for HVAC systems in schools?**

[ASHRAE](#) offers guidance for school HVAC systems, as well guidance for specific areas in a school such as isolation rooms (student health facilities) and gymnasiums. ASHRAE also provides guidance for areas with higher risk activities such as music rooms<sup>4</sup>.

**Q5: Are there Temperature and Humidity Guidelines for schools?**

ASHRAE recommends the following criteria for classrooms during summer and winter months<sup>4</sup>:

- The winter classroom design guideline is a minimum temperature of 22°C (72 F) and 40-50% relative humidity (RH) for areas with humidifiers/active humidification (central or local, depending on the classroom/space system). Adjustments of the humidity minimum, humidifier, and sensor location should be made in consultation with your building maintenance professional due to the potential for condensation within the building envelope.
- The summer classroom design guideline is a temperature of 24°C (75 F) and 50%-60% RH. Designing to 50% RH in summer is the primary guidance, depending on the classroom system.

For more information on the guidelines for HVAC systems, system checks and verifications please visit: [ASHRAE Reopening of Schools and Universities<sup>4</sup>](#). Schools should aim to achieve maximum fresh air exchange that will still enable them to maintain comfortable heating and humidity levels.

**Portable Air Cleaners:**

**Q6: Are portable air cleaners an effective way to reduce COVID-19 risk in school classrooms?**

Air cleaning devices are likely to reduce the overall concentration of airborne virus particles in indoor air. The primary concerns for COVID-19 virus transmission is droplet transmission and surface contamination, however there is growing evidence that airborne virus transmission is also a risk<sup>5</sup>.

Air cleaning devices reduce the concentration of COVID-19 virus in the air, but do not reduce droplet transmission or surface contamination. Air cleaning devices should only be used in addition to other preventative measures such as physical distancing, handwashing, surface sanitizing, and appropriate use of masks or face coverings.

Portable air cleaners may be particularly helpful when additional ventilation with outdoor air is not possible without compromising indoor comfort (temperature or humidity), or when outdoor air pollution is high. For example, opening windows may not be practical in schools during the winter months in most of Alberta<sup>6</sup>.

**Q7: What types of portable air cleaning devices are available? Is one type better?**

The most common portable air cleaning devices use either a High Efficiency Particulate Air (HEPA) filter, Ultraviolet (UV) disinfection, or a combination of both. HEPA filters clean the air by removing small particles, such as viruses, out of the air before recirculating. UV disinfection inactivates live viruses so they will not be able to infect people and cause illness<sup>5</sup>.

Provided these devices are certified for efficacy by an independent body such as UL or NSF, both types of air cleaning devices are effective in reducing airborne virus concentrations in indoor settings.

**Q8: Is there anything else that needs to be considered when using portable air cleaning devices?**

When using portable air cleaning devices, you are modifying airflow in a room. Directing the airflow so that it does not blow directly from one person to another is important to reduce the potential spread of droplets that may contain infectious viruses<sup>6</sup>. In a school setting, this means that a portable air cleaning device should not be placed in a manner that draws contamination from one student to other students in the room. Putting a portable air cleaning device closer to the largest source of contamination (for example, a teacher who does the most talking in the classroom) may also help reduce this risk.

In addition to proper placement, it is also important to ensure that air filtration rate (volume of air filtered over time) is adequate for the size of the classroom<sup>6</sup>. A method to determine portable air cleaner size is by using the [portable air cleaner calculator](#)<sup>7</sup>.

**Fans:**

**Q9: Can fans be used in schools during the COVID-19 pandemic?**

The use of table or pedestal fans should be avoided. Air blowing from an infected person directly at another in closed spaces may increase the risk of transmission of the virus from one person to another<sup>8</sup>.

At school, if the use of table or pedestal fan is unavoidable, it is important to increase outdoor air changes by opening windows and minimize the air blowing from one person (or group of people) to another person (or group of people)<sup>8</sup>.

The use of ceiling fans can improve circulation of outside air and avoid pockets of stagnant air in occupied spaces. However, it is critical to maintain good outdoor ventilation when using ceiling fans. An efficient way to increase outdoor air exchange is by opening windows<sup>8</sup>.

Rotate blades of ceiling fans counterclockwise to draw air up while in use in order to pull contaminated air away from students<sup>8</sup>.

[Resource Guide for school IAQ](#)

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\*Commonly used resources for IAQ in schools

### ASHRAE Resources:

Resource Title	Format	Details
<a href="#">COVID Resources</a>	Infographic	Links to all ASHRAE information related to COVID
<a href="#">Reopening of Schools and Universities</a>	Webpage	Detailed information on indoor air quality for schools. Including: HVAC, filtration, room specific information in schools, assembly information, checklists and operation references.
<a href="#">Guidance for Building Operations During the COVID-19 Pandemic</a>	Document	Guidance for buildings in general with reference to school buildings
<a href="#">ASHRAE Epidemic Task Force – Schools &amp; Universities</a>	Document	Specific guidance on equipment & system checks (pre operation and during academic year). Design Recommendations, filtration and infection control
<a href="#">ASHRAE Standards &amp; Guidelines</a>	Documents	Guidelines and Standards for ventilation to address COVID-19 (Free editions if read online) *62.1 Ventilation for Acceptable Indoor Air Quality

### Other Resources:

Resource Title	Agency	Format	Details
<a href="#">COVID-19 Guidance for Schools K-12</a>	Health Canada	Webpage	Guidance on the potential risks and mitigation strategies for schools
<a href="#">FAQ: COVID-19: Heating, Ventilation and Air Condition (HVAC) Systems in Buildings</a>	Ontario Public Health	Document	Frequently asked questions on HVAC systems in buildings during COVID-19 pandemic
<a href="#">Strategies for Protecting k-12 School Staff from COVID-19</a>	Centers for Disease Control and Prevention	Webpage	Specific Section on Engineering controls in school buildings and increasing ventilation

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<a href="#">Healthy Indoor Environments in Schools: Plans, Practices, Principles for Maintaining Healthy Learning Environment</a>	US Environmental Protection Agency (USEPA)	Webinars	Previously recorded webinars for school staff to respond to IAQ in schools
<a href="#">EPA Supports Healthy Indoor Environments in Schools During COVID-19 Pandemic</a>	US Environmental Protection Agency (USEPA)	Webpage	Guidance and helpful tips for IAQ in schools
<a href="#">COVID-19 Guidelines for Specific School Spaces</a>	Yale School of Public Health	Webpage	Ventilation recommendations and suggestions for school spaces such as upper grade classrooms, lower grade classrooms, music room, art room, computer lab, gymnasium, restroom, cafeteria, hallways, library, playgrounds
<a href="#">Ventilation Key to Reducing Risk</a>	Yale School of Public Health	Flow Diagram: ventilation risk in school Webpage	Evaluate potential risk reduction controls in existing school infrastructure. Suggestions to improve ventilation
<a href="#">Schools for Health: risk Reduction Strategies for Reopening Schools: COVID-19</a>	Harvard School of Public Health	Document	Healthy Buildings: p. 31-40. portable air cleaners, filtration and HVAC information
<a href="#">Coronavirus Disease (COVID-19): Schools</a>	World Health Organization	Webpage: FAQ	Question: Specific recommendations on school ventilation and air conditioning use.
<a href="#">Coronavirus disease (COVID-19): Ventilation and air conditioning</a>	World Health Organization	Webpage: FAQ	Information on air condition and fan use (mentions school use)

References:

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3. ASHRAE (2020). Epidemic Task Force. Schools & Universities. [https://images.magnetmail.net/images/clients/ASHRAE/attach/ashrae\\_reopening\\_schools\\_and\\_universities\\_c19\\_guidance.pdf](https://images.magnetmail.net/images/clients/ASHRAE/attach/ashrae_reopening_schools_and_universities_c19_guidance.pdf)
4. ASHRAE (2020). Reopening of Schools and Universities. <https://www.ashrae.org/technical-resources/reopening-of-schools-and-universities>
5. British Columbia Center for Disease Control (BCCDC). (2020, August 24). About COVID-19: How it Spreads <http://www.bccdc.ca/health-info/diseases-conditions/covid-19/about-covid-19/how-it-spreads>
6. United States Environmental Protection Agency (US EPA). (2020, August 21). Air Cleaners, HVAC Filters, and COVID-19. <https://www.epa.gov/coronavirus/air-cleaners-hvac-filters-and-coronavirus-covid-19>
7. Harvard Schools for Health (2020). Risk Reduction Strategies for Reopening School. Portable Air Cleaner Calculator for Schools. [https://docs.google.com/spreadsheets/d/1NEhk1IEdbEi\\_b3wa6gl\\_zNs8uBJjISS-86d4b7bW098/edit#gid=1882881703](https://docs.google.com/spreadsheets/d/1NEhk1IEdbEi_b3wa6gl_zNs8uBJjISS-86d4b7bW098/edit#gid=1882881703)
8. World Health Organization (2020). Coronavirus disease (COVID-19): Ventilation and air conditioning. <https://www.who.int/news-room/q-a-detail/coronavirus-disease-covid-19-ventilation-and-air-conditioning>