

VENTILATION AND INDOOR AIR QUALITY

schools and childcare facilities



People generally spend most of their time indoors, including at home, school, and work. Air pollutants that impact indoor air quality can come from outdoors and indoors. Examples of indoor air pollutants include gases (e.g. carbon monoxide), solid particles (e.g. those in smoke), and biological contaminants (e.g. mould). Poor indoor air quality can be harmful to health.

We spend most of our time indoors, so taking measures to reduce air pollution indoors can help protect health.

Indoor air quality can be improved by:

- Preventing the introduction of air pollutants (e.g. using products with fewer contaminants, preventing wildfire smoke from getting indoors)
- Ensuring good ventilation (fresh outdoor air is moved to indoor environments, and stale indoor air is removed)
- Cleaning the air to remove contaminants

This document is part of a series of public health guidance on indoor air quality in schools and childcare facilities. Our documents on **wildfire smoke and traffic-related air pollution** discuss these specific pollutants and ways to address them in more detail.



Consider monitoring for indoor temperature, particulate matter, and carbon dioxide (CO₂). Your local health authority has temperature, CO₂, and particulate matter sensors available for short-term loans. Contact your local health authority for support with monitor selection, data review, and guidance on thresholds for action. Some municipal libraries have air quality monitor lending programs as well.

VENTILATION AND INDOOR AIR QUALITY

schools and childcare facilities

The role of ventilation:

Ventilation is supplying **fresh outdoor air to an indoor environment** and diluting or removing stale indoor air. This may be by natural means (e.g. open windows) or mechanically, by heating, ventilation and air-conditioning (HVAC) systems. On good air quality days (most days in our region), bringing in outdoor air can dilute the concentration of pollutants indoors.

Poorly ventilated spaces can **allow indoor air pollutants** to build up and potentially impact health.

Studies demonstrate a connection between improvements in indoor air quality — either from increased outdoor air ventilation rates or from the removal of pollution sources — and improved performance of children and adults ([US EPA](#)).

Visit the [US Environmental Protection Agency site on Healthy School Environments](#) for more information.



The role of ventilation and air filtration in the transmission of respiratory infections:

Many respiratory infections are transmitted through the air from a person infected with a virus or bacteria. Ventilation and air filtration may help to **reduce transmission of respiratory infections**, particularly in crowded, poorly ventilated spaces. Indoor air quality measures and infrastructure are part of a multi-layered approach to preventing respiratory infections, including staying home when sick, appropriate vaccination and hand/respiratory hygiene. Further information is available in [ASHRAE Standard 241: Control of Infectious Aerosols](#).

VENTILATION AND INDOOR AIR QUALITY

schools and childcare facilities



The role of carbon dioxide (CO₂) monitoring:

When we breathe out, we release the gas CO₂ into the air. Increasing concentrations of CO₂ in indoor spaces can be an indicator of poor ventilation.

Typical levels of CO₂ in indoor air are not a health concern. However, elevated CO₂ levels can indicate that a space has insufficient ventilation. High levels of CO₂ and other air contaminants can contribute to:

- Headaches
- Fatigue
- Difficulty concentrating
- Dizziness
- Stuffy, congested or runny nose, sneezing, coughing, eye irritation

These effects are not only from CO₂, but from the buildup of other air pollutants indoors due to poor ventilation.

Increased CO₂ concentrations may indicate an increased risk of infectious disease transmission in a space.

How to interpret indoor CO₂ levels:

Ideally, indoor CO₂ levels should be below 1000 parts per million (ppm), and as close to outdoor levels as feasible (400 - 500 ppm). [Health Canada](#) has set 1000 ppm as an indoor long-term exposure limit, based on a 24-hour average. Note that severe health effects from CO₂ occur at levels above 5000 ppm.

It is normal to see changes in CO₂ levels throughout the day as occupants come and go from the space. **It is recommended to monitor spaces consistently for a period of time (e.g. one week) to determine when and why CO₂ levels are increasing. This can help you to understand when to take action where possible to improve ventilation.**



VENTILATION AND INDOOR AIR QUALITY

schools and childcare facilities

How to improve ventilation and indoor air quality

The following are recommended *options* to help protect health, where feasible and appropriate.

- **Open windows or doors** on good air quality days. This can increase the amount of air coming inside. Note that this is not recommended on poor air quality days, when it is smoky outdoors. See our fact sheet on wildfire smoke to learn more. For buildings near major roads, truck routes or railways see our fact sheet on traffic-related air pollution.
- **Maintain, repair, and/or upgrade** Heating, Ventilation and Air-Conditioning (HVAC) systems. This includes ensuring the HVAC system has the highest level of filtration suitable for the equipment. MERV 13 (MPR 1900) or higher is recommended.
- Set HVAC systems to higher ventilation settings.
- HVAC fans should be set to keep them running at all times so that the building air is recirculated through the HVAC filter continuously (i.e. not on auto).
- **Portable air cleaners** with HEPA filters are effective in reducing some important air contaminants, including smoke particles and aerosols containing bacteria or viruses. See our wildfire smoke and traffic-related air pollution fact sheets to learn more about the important role of air filtration and how to choose and use portable air filters.
- Ensure fuel-burning appliances are **properly venting**.
- Use a **range hood exhaust fan** with outside venting whenever cooking.
- Fix moisture problems and **control humidity levels**. Health Canada recommends an optimal relative humidity range of 35 to 50%.
- Choose carpets, furniture, paint, and cleaning products that have lower volatile organic compounds (VOCs).



DID YOU KNOW?

Dampness and mould in indoor environments can cause an increase in several respiratory and asthma-related health outcomes. It is important to control moisture indoors (e.g. leaks and humidity).

VENTILATION AND INDOOR AIR QUALITY

schools and childcare facilities

When outdoor air quality is poor

It is also important to consider outdoor air quality when operating a ventilation system, and **reduce entry of outdoor air pollutants**. This is especially crucial during **wildfire smoke events**.

Outdoor air pollution can come from several sources including wildfire smoke and traffic. Outdoor air pollution can substantially impact indoor air quality because much of this pollution can move indoors. **Most of our exposure to pollution from outdoor sources occurs inside homes and buildings because we spend most of our time inside.**

How to manage the impact of outdoor air pollution on indoor spaces:

- During wildfire events, it is important to increase air filtration and potentially adjust ventilation so less outdoor air is moved inside. Windows and doors to the outdoors need to be closed for air filtration to be most effective (for more information, see our [Wildfire Smoke guidance document for schools and childcare facilities](#) for more information).
- For buildings located in an area with poor air quality (such as near a busy road), consider **enhancing filtration** in the HVAC system to help remove pollution before it comes indoors. For facilities without HVAC systems, consider **opening windows for short periods** throughout the day, while **running portable air cleaners** indoors (see our traffic-related air pollution document for more information).

DID YOU KNOW?

It is important for schools and childcare facilities to filter indoor air and potentially reduce outdoor air ventilation during wildfire smoke events (see our wildfire smoke document for more information).



Want to learn more?

Check out these other guidance documents for schools and childcare facilities:

