

Indoor Ventilation: Guidance During The COVID-19 Pandemic

Canadians spend most of their time in indoor settings, especially during the COVID-19 pandemic. The virus causing COVID-19 is known to spread through infectious respiratory particles and aerosols when a person who is infected breathes, talks, sings, shouts, coughs or sneezes.

This tip sheet gives information and advice on indoor ventilation and how it relates to COVID-19. It will also provide guidance for building owner/operators, workers, and workplace visitors on ways to reduce the spread of infectious diseases, including COVID-19, which spread through the air.

Ventilation and Indoor Air Quality

Good air quality is defined as being clear, clean and free of contaminants such as smoke, dust, biological and gaseous impurities. Indoor ventilation is the deliberate introduction of outside air into indoor spaces to increase the amount of outside air brought inside in order to dilute the concentration of contaminants in the air. The most basic form of ventilation, natural ventilation, is the opening of windows and doors to the outside. When using mechanical ventilation, outside air is often conditioned (heated or cooled) and filtered before being circulated throughout the building.

Most heating, ventilation and air conditioning (HVAC) systems in buildings are designed for maximum energy efficiency:

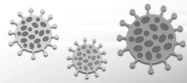
- Indoor air is typically 80% recycled air and 20% air from outdoors.
- Filtration is generally not designed to remove microscopic contaminants such as small virus particles from the air.
 - There are some exceptions: ventilation in health care facilities (e.g. hospitals) is designed to reduce disease transmission by venting air from patient and operating rooms outdoors or through medical grade filters keeping the air safe for other patients and hospital workers.

Air Circulation versus Ventilation

While introducing fresh outside air into a space via ventilation is often accompanied by the deliberate exhaust of stale indoor air, air circulation is simply the movement of air within a specific space without undergoing any filtration. This is usually achieved with the use of a fan (e.g., ceiling fan, floor fan, or ventilation system fan).

How Ventilation Impacts the Spread of Viruses

- For the COVID-19 virus, ventilation will not reduce transmission that occurs during close-range contact (within 2 metres). It is essential that all public health measures be implemented and followed.
- Viral accumulation in the air is dependant on ventilation rate, air mixing patterns, room size, occupancy, type of activity undertaken, and amount of virus released.
- Ventilation can decrease the concentration of respiratory particles in the air that may contain infectious virus, which may reduce the chance of COVID-19 spread in the ventilated space.
- Increasing ventilation rate will decrease the amount of potentially infectious respiratory particles in the air.
- Small rooms will achieve a greater concentration of infectious respiratory particles faster than large rooms (assuming they have the same amount of virus released over the same period).
- The presence of potentially infectious particles is dependant on the number of occupants in the space, number of infected individuals in a space, the type of activity (e.g., singing, speaking loudly, and exercising), time since infection, and individual factors (e.g., communicability among those infected).
- While poor ventilation has been linked to COVID-19 outbreaks by allowing the accumulation and transmission of virus containing aerosols in indoor spaces, the highest risk for transmission is from close contact with a person infected with SARS-CoV2.
- There is no evidence to indicate that SARS-CoV2 can be transmitted via ventilation ducting.



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Maintenance, Engineering and Other Air Quality Considerations

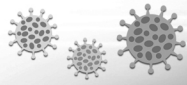
- Ensure that your ventilation system is properly rated and configured for your buildings' type of setting, type of activity, maximum occupancy and length of time the space is occupied. Consult with an HVAC professional for advice.
- Maintain HVAC systems according to manufacturer's recommendations.
- Adjust ventilation vents and fan direction to avoid blowing air directly from person to person.
- Install lids on all toilet seats and keep the lids closed, particularly during flushing.
- When outside air is of poor quality (e.g., allergens, wildfires, heavy smog), it may be necessary to minimize the outside air intake into a building.
- Make sure that building maintenance workers are properly trained and protected (e.g., personal protective equipment (PPE)) when performing HVAC system maintenance.
- Consider implementing procedures or automatic trap seal primers to ensure all drainage p-traps are filled regularly (especially floor drains that may not be frequently used) to prevent air and contaminants from being drawn into the building from the sanitary sewer system.

Improving Ventilation

- Ensure the system is operating and has been maintained as per design specifications and manufacturer instructions.
- Run ventilation systems continuously at maximum rate to minimize the accumulation of viruses in the air. Alternatively, run HVAC systems at maximum air changes setting for 2 hours before and after periods when the room or building is occupied.
- Improving the ventilation effectiveness will remove contaminants more efficiently (for example eliminating short circuiting in a space).
- Disable or bypass demand-control ventilation (DCV) controls that reduce air supply based on occupancy.
- Re-program variable air volume (VAV) systems to operate in constant air volume mode (CAV), if possible. If not, increase the minimum air fraction to ensure increased ventilation at all times.
- Open windows and doors to allow outside air in, as weather permits and if it does not pose a safety risk to the occupants. Doing so even for a few minutes at a time throughout the day can improve ventilation with minimal impact on indoor temperature.
- Increase the ventilation in washrooms and kitchens/break rooms by continuously running local exhaust fans.

Other Ways to Improve Indoor Air Quality

- Consult an HVAC professional about installing the highest rated Minimum Efficiency Reporting Values (MERV) or High-Efficiency Particulate Air (HEPA) filters compatible with your ventilation system(s). Adjust filter replacement schedules, if required, as new filters could require more frequent changes.
- Consult with an HVAC professional for options that would be compatible with your systems and building when considering air purifying, filtering or air exchange system upgrades such as ultraviolet germicidal irradiation (UVGI), heat recovery ventilation (HRV) or air economizer. Disinfection technologies must be approved by Health Canada.
- Operate humidification systems to maintain building air relative humidity between 30-50%. Airborne particles have been shown to be impacted by air humidity in the following ways:
 - Dry air causes respiratory droplets to decrease in size and stay suspended in the air longer; it also causes mucous membranes in the nose to dry out and be more permeable to viruses.
 - Humid air causes respiratory droplets to increase in size causing them to fall to the ground more rapidly.
 - Note: Humidifiers should be used with caution as increasing humidity too much can lead to condensation on surfaces, as well as inside walls and building areas where it cannot be seen. This can lead to [mould](#) growth and the proliferation of mites.



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- The use of a portable air cleaner with HEPA filters could be considered in areas with poor ventilation; or where natural or mechanical ventilation is not feasible. Using portable air cleaners has not specifically been proven to be effective against the virus that causes COVID-19 and require ongoing maintenance for effective operation. As such, they should not be used alone or as a replacement for adequate ventilation and [personal preventive practices](#) (e.g. avoiding closed spaces, crowded places, and close contact settings; wearing a well-constructed and well-fitting mask; physical distancing, etc). A better option would be to use larger, properly ventilated room instead.
- Circulating air within a space may help spread viruses and other contaminants. Carefully evaluate all air circulating fans: ensure that fans are positioned to blow inside air to the exterior, and avoid placing fans that blow air directly at or between people in a room or that move air from the ground up as these can increase the risk of virus transmission.

Other Considerations

- Ventilation alone cannot stop the spread of COVID-19. It is important to use ventilation in combination with other public health measures and mitigation strategies to help reduce COVID-19 spread and protect yourself and others.
- Implement measures to avoid crowding inside your buildings.
- Maximize distance between people and always maintain a physical distancing of at least 2 metres when in a space with other people.
- Post reminders at entrances for guests and employees to stay home if they feel or are sick, even if symptoms are mild.
- Mandate the use of a non-medical mask inside buildings. It is important that non-medical masks are well-constructed, well-fitting and properly worn.
- Promote proper hand hygiene and respiratory etiquette. Including recommendations to:
 - Wash hands for 20 seconds or use hand sanitizer with minimum 60% alcohol content frequently but especially after going to public spaces.
 - Sneeze and cough into your mask, sleeve or tissue (throw out tissue immediately) and wash hand afterwards. If you are coughing stay home.
- Promote physical distancing of at least 2 metres inside your buildings, even if your building is well ventilated. Respiratory viruses can still spread between people that are in close proximity for a prolonged time.

Protect Yourself and Others

- If you notice that air ventilation ducts have been blocked, removed, or are obviously missing in a public space you are visiting, inform the manager and consider moving to a space with better ventilation.
- If you are concerned about the air quality in a building you are frequenting, ask the management:
 - Is the ventilation system maintained regularly?
 - Have filters been replaced regularly?
 - Has the system been set to the maximum air change per hour setting?

All answers should be 'yes' if systems are properly inspected, maintained and adjusted.

- Trust your senses: if you smell, taste or see the air quality deteriorating in your surroundings seek fresh air and inform building management about your observations.
- Educate yourself about building ventilation using trusted sources of information (i.e., Health Canada, PHAC, NCCEH, EPA, CDC, ASHRAE).
- Monitor air conditions in your workplace. If you notice that air circulation stops or it gets unusually hot, cold or humid, leave the space, if possible, and notify your manager. If working in a space where air quality and/or ventilation is a concern and cannot be improved, consider the use of portable air filtration devices with HEPA filters and follow the manufacturer's recommendations. These types of cleaners are effective in small areas and need to be placed close to individuals and preferably in the middle of the room to ensure the maximum amount of the air is filtered.
- For work tasks of a hazardous nature, follow your existing job-specific PPE requirements, such as respiratory protection or other PPE.



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Additional Resource Links

- [Coronavirus disease \(COVID-19\): Ventilation and air conditioning in public spaces and buildings](#), WHO
- [Building Readiness](#), ASHRAE
- [Ventilation in Buildings](#), CDC
- [Ventilation and Coronavirus \(COVID-19\)](#), EPA
- [COVID-19 frequently asked questions: General ventilation and air circulation](#), Worksafe BC
- [COVID-19: Heating, Ventilation and Air Conditioning \(HVAC\) Systems in Buildings](#), Public Health Ontario
- [COVID-19: Guidance on indoor ventilation during the pandemic](#), PHAC

If you or someone you know is in crisis, please contact your local hospital, call 911 immediately, or contact a Crisis Centre in your area.

<https://suicideprevention.ca/need-help/>



For further information on COVID-19, refer to the Public Health Agency of Canada
<https://www.canada.ca/coronavirus>

Note that this guidance is just some of the adjustments organizations can make during a pandemic. Adapt this list by adding your own good practices and policies to meet your organization's specific needs.

Disclaimer: As public and occupational health and safety information is changing rapidly, local public health authorities should be consulted for specific, regional guidance. This information is not intended to replace medical advice or legislated health and safety obligations. Although every effort is made to ensure the accuracy, currency and completeness of the information, CCOHS does not guarantee, warrant, represent or undertake that the information provided is correct, accurate or current. CCOHS is not liable for any loss, claim, or demand arising directly or indirectly from any use or reliance upon the information.