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Carbon Dioxide (CO_2) Monitoring for Indoor Air Quality (IAQ)

Where Does Indoor CO_2 Come from and Why is it Important?

When we exhale, we add CO_2 (carbon dioxide) to the air. In fact, each breath from an average adult contains 35,000 parts per million (ppm) of CO2. As more people remain in a room, CO_2 levels increase quickly if there is not enough fresh air coming into the space. High indoor CO_2 levels can cause tiredness, headaches, and other symptoms. Increasing CO_2 levels show you that the space is not well ventilated.

What's the Difference between Carbon Monoxide (CO) and CO_2?

CO (carbon monoxide) is a gas that is often called the silent killer because it contains no smell, colour, or taste and can cause illness or death. CO is produced when things like coal, gasoline, natural gas, oil, propane, wood, or tobacco are burned. Other sources of CO include vehicle exhaust, BBQs, and lawn equipment. CO risks are present year-round but can be riskier in winter when people are heating their homes.

CO_2 is another gas but is mainly produced when people exhale. Reducing CO_2 can be done by increasing ventilation and decreasing the number of people in one space. Health Canada has set the long-term exposure limit for CO2 in residential settings (i.e., in your home) at 1,000 ppm, averaged over a 24-hour period. However, it is normal for CO_2 levels to fluctuate, and serious health effects are not expected below 5,000 ppm.

If CO_2 levels begin to rise, this indicates that not enough fresh air is coming in for the number of people present. Generally, you should aim to keep CO_2 levels below 1000 ppm, or ideally, as close to outdoor levels as possible.

Indoor CO_2, in parts per million	Ventilation performance, with respect to the number and activity level of people in the space
600 or under	Excellent ventilation
601-800	Good ventilation
801-1000	Fair ventilation
1001-5000	Poor ventilation
Over 5001	Dangerous ventilation

Why Ventilation and Filtration is Important

Increasing air circulation, using air filtration, and removing pollutants can improve IAQ. Risk of illness can be reduced with good ventilation and air filtration. Reducing the number of people in the room will also decrease risk. Air filtration units (i.e., HEPA filters) will only remove particles from the air, not CO_2.

How to Place/Install a CO_2 Monitor

CO_2 monitors should be placed on a wall at a height of 1-2 metres and well away from

windows or air supply vents, and at least 2 metres away from people or open flames. Once installed, you should see CO_2 levels change a lot as people enter and leave the space, or when windows and doors are opened.

The Aranet4 carbon dioxide monitor provides measurement data on its screen. Excellent CO_2 level is under 600 ppm. Levels over 5,000 ppm is considered high concentration–level typically associated with complaints of drowsiness and poor air quality.

What Do High Levels of Carbon Dioxide (CO_2) Mean?

High CO_2 levels can mean that ventilation is insufficient for the number of people present, which might also be causing other IAQ issues. CO_2 levels can be affected by many different things, such as:

- Age of a building (not designed with current ventilation needs in mind).
- Design of a building (built for one purpose, but now used for another).
- Function of the building (may have windows that can't open for certain reasons).
- Size of the building (may not allow for people to spread out).
- Number of people in the building.
- Other CO_2 sources, such as smoking, stoves, furnaces, water heaters, and pets.

Also consider:

- CO_2 sensors can tell you if the ventilation is okay, but dangerous indoor air pollutants can still be present even if CO_2 levels are low.
- Remove sources of indoor air pollutants using Health Canada's IAQ resources.
- Wildfires, extreme heat, and other sources of outdoor pollution may impact IAQ.
- If outdoor pollution is present, indoor air filtration becomes more important.

Increasing Ventilation and Decreasing CO_2 Concentration

If your CO_2 monitor is showing higher levels of CO_2, you may consider one or more of the following:

- Reducing the number of people in the building.
- Avoiding strenuous activities like singing, dancing, and shouting
- Servicing or upgrading your HVAC system; Consider using HEPA filters.
- Increasing the amount of outdoor air being drawn into your HVAC system.
- Placing portable air filtration systems throughout the building.
- Opening windows and doors (install screens if necessary)
- Increasing the humidity of your space.