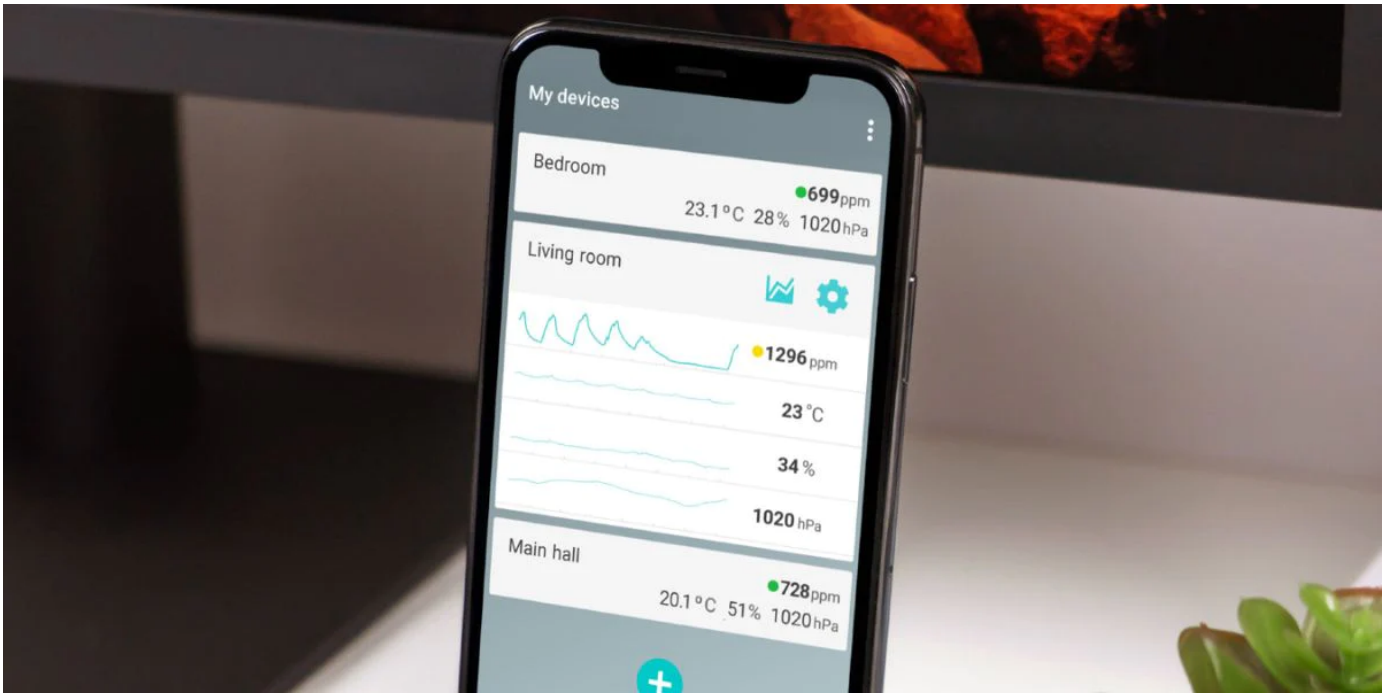
High CO2 Levels Indoors Will Surprise You

December 07, 2023



Carbon dioxide (CO2) levels in homes, classrooms, and office buildings can be hazardous to occupants. The challenge for many is that they are not clear on what is considered a high CO2 level, how to measure it and how to mitigate it.

Organizations like the U.S. Green Building Council, the Occupational Safety and Health Administration - OSHA, and the Center for Disease Control - CDC are all working to provide an adequate amount of data surrounding the importance of monitoring CO2 levels indoors and the potential long-term effects of exposure on individuals exposed to higher than normal amounts of CO2.

Many individuals are surprised when it comes to the importance of carbon dioxide monitoring and recognizing the direct impact high CO2 concentrations have on their overall well-being, productivity, and cognitive skills.

Why measure CO2 in

Have you ever been in a meeting after lunch, and felt groggy or unfocused? Feeling ou will barely make it through the remainder of the day, making your way into the breakroom

for another coffee or energy drink? This might have more to do with the CO2 levels and less to do with the after effects of a full stomach.

A study published by Lawrence Berkley National Laboratory notes that, "People produce and exhale carbon dioxide (CO2) as a consequence of their normal metabolic processes; thus, the concentrations of CO2 inside occupied buildings are higher than the concentrations of CO2 in the outdoor air." The ill feelings, tiredness, lack of focus, and even nausea can be attributed to higher CO2 levels as our bodies go through its natural processes. Indoors, this can lead to sick building syndrome.

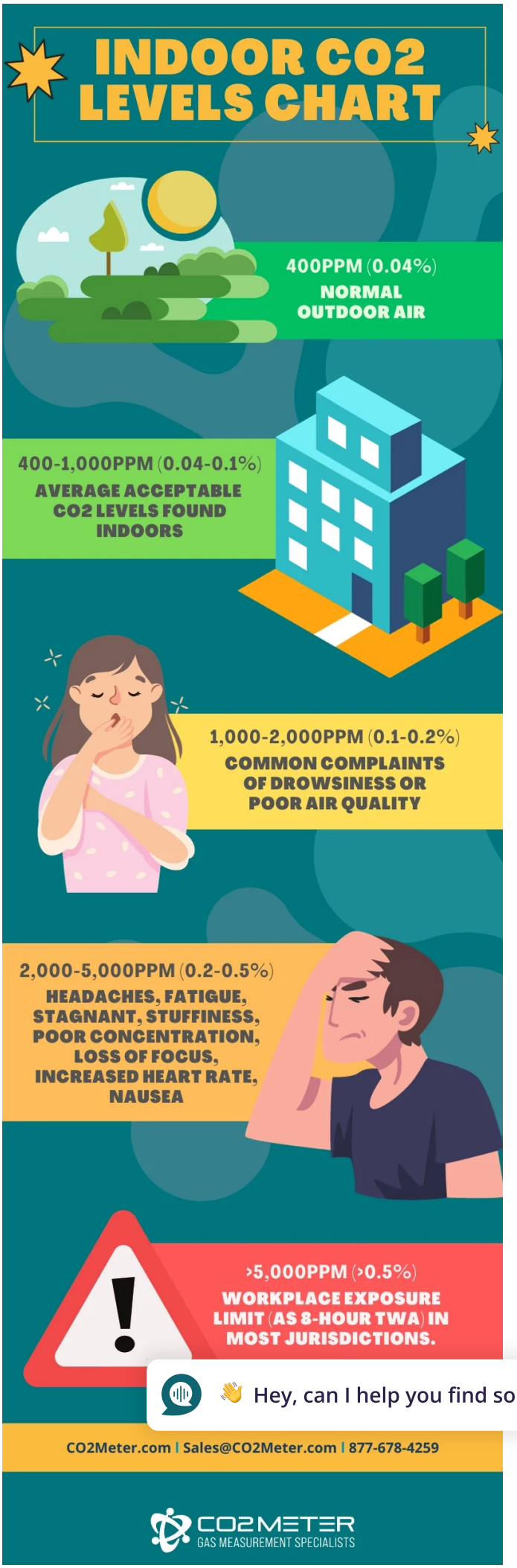
In fact, higher CO2 levels indoors may also bring on many of the same symptoms defined in sick building syndrome. On the contrary, monitoring CO2 indoors has been stated to dramatically reduce these specific illnesses.

Overall, by monitoring CO2 levels one can protect occupant health, promote productivity, manage costs, comply with regulations, and maintain a positive reputation. By creating healthier and more comfortable indoor environments, the prevalence and impact of sick building syndrome can also be minimized, benefiting both individuals and organizations.

What is the acceptable co2 levels in buildings?

The acceptable CO2 levels in buildings depend on various factors, including the specific purpose of the building and the local regulations or guidelines in place. However, there are general recommendations and standards that are commonly followed to ensure indoor air quality.

The most widely accepted guideline for CO2 levels in buildings is based on ventilation rates. The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) recommends maintaining indoor CO2 levels below 1,000 parts per million (ppm) as a guideline for acceptable indoor air quality in buildings.



Download to Print

Here are the CO2 concentration levels commonly used as guidelines:

1. **Good Indoor Air Quality:** Normal outdoor air is around 400 ppm. Guidelines state that CO2 levels below 800 ppm are often considered as a marker for good indoor air quality. Maintaining CO2 levels below this threshold ensures better ventilation and a higher level of comfort for occupants.
2. **Acceptable Levels:** The average indoor environment tends to hold CO2 levels around 400 ppm - 1,000 ppm. These levels ensure adequate ventilation and a reasonably fresh indoor air quality.
3. **Ventilation Standards:** Some countries or organizations have specific regulations or standards for CO2 levels in buildings. For example, the LEED certification system for green buildings recommends a maximum CO2 level of 700 ppm above outdoor levels as part of their Indoor Environmental Quality (IEQ) criteria.

It's important to note that CO2 levels alone do not determine overall indoor air quality. Other pollutants, such as volatile organic compounds (VOCs), particulate matter, and chemical contaminants, should also be considered. Additionally, specific environments like medical facilities, laboratories, or industrial settings may have more stringent requirements based on their unique needs.

To maintain acceptable CO2 levels in buildings, proper ventilation systems and practices are crucial. Regular maintenance and monitoring of HVAC systems, ensuring an adequate fresh air supply, and considering the number of occupants and their activities can help manage CO2 levels effectively.

Click the links below to see each organization's safe carbon dioxide levels and exposure limits:

1. OSHA: Occupational Safety and H
2. ASHRAE: American Society of He
3. NIOSH: National Institute for Occupational Safety and Health
4. USGBC: U.S. Green Building Council

5. EPA: Environmental Protection Agency
6. U.S. Department of Agriculture

Safe CO2 Levels Indoors

The word “safe” can be used to mean either “best” or “potentially harmful.” What’s important to note is that CO2 is natural. Except in levels above 3-5% it is not a dangerous gas.

Best Indoor CO2 Levels

CO2 levels indoors should be as close to 400 ppm (outdoor CO2 concentration) as possible, and no more than 1000 ppm above outdoor air. If the threshold is exceeded, additional fresh air should be added to renew the air.

Not that while this was the most recent mention of CO2 levels in the 1999 ASHRAE Standard 62, it has since been removed in the 2004 version. A more accurate understanding of the ASHRAE position on CO2 is available here (pdf). They state that the fresh air flow per person should be anywhere from 5-60 cubic feet per person per minute depending on the use of the area.

However, as a rule of thumb, a maximum CO2 level between 1,000 ppm and 1,100 ppm indoors is a good goal for any home, office or classroom.

Potentially Harmful CO2 Levels

Technically, anything above the “safe” CO2 levels indoors indicates a problem with fresh air flow, not high CO2 levels per se. However, numerous studies over the years have found a direct correlation between high CO2 levels indoors (as the result of lack of fresh air) and high levels of mold, dust, bacteria and viruses in the air. In addition, high levels of CO2 correlate with increased drowsiness and lower cognitive ability.

The problem with a mechanical defi
occupants who are attempting to mo
classroom. Instead, CO2 monitors are an inexpensive alternative that provides a sn
of air quality that can be used to determine if further mitigation is needed.

Again, as a rule of thumb, CO2 levels above 1,200 ppm indoors indicate potential air flow issues, while CO2 levels above 2,000 ppm have been shown to increase occupant complaints of room “stuffiness” as well as statistically higher levels of negative respiratory effects.

How do you treat high CO2 levels?

It’s important to know how to discern whether your building has poor indoor air quality. This can be done by using CO2 monitors to take readings of your home.

For instance, devices like CO2 indoor air quality monitors work great for maintaining peace of mind and having a device to indicate when ventilation is required or the need to open a window is vital.

Additionally, If you notice you become tired frequently, nauseated, or suffer from constant headaches or bodily discomfort – you should check the CO2 levels.

5 ways to improve air quality in your home

1. Replace your furnace air filter
2. Control the humidity
3. Pay attention to what you bring indoors
4. Have your furnace inspected
5. Use an Indoor Air Quality Monitor

1. Replace Your Furnace Air Filter

Experts recommend that you change air filters in your central air conditioner, furnace, or heat pump every month they are in use. The air filter’s job is not only to keep the air clean from contaminants, but it also keeps dust and debris out of your heating, ventilation, air conditioning system as well as your

Dirty air ducts can be a breeding ground for mold spores in the air. It is far more cost-effective to change your filters regularly than to pay for duct cleaning too.

Replacing air filters is easy - remembering to do it is difficult. Here's a tip: purchase several air filters at a time, and stack them next to your furnace or HVAC equipment. Next, set an alarm on your smartphone calendar to remind you on the first day of every month to change or clean your filters. Don't have a smart phone? Write the date you've changed the filter on the edge of the filter so you'll know the last time you changed it.

Another common question is, which air filter should I use? According to the experts, the higher the minimum efficiency reporting value, or MERV, the better. MERV ratings signify an air filter's effectiveness at decreasing airborne particles and contaminants which will improve the indoor air quality in your home.

Learn more about MERV ratings here.

2. Control the Humidity

Your home's relative humidity should be high enough to prevent coughing and nosebleeds, but low enough that you don't create moisture problems like mold growth.

Indoor relative humidity levels need to take into account the temperature change between summer and winter. In colder climates, wintertime humidity levels should be 30-40% to prevent condensation on windows and other surfaces. In the summer, humidity can be higher, up to 50-60%.

Learn more about the impact of proper humidity levels in your home.

If you do not have a humidifier or dehumidifier connected to your home's furnace, you should invest in a humidifier to use in the winter and dehumidifier to use in the summer.

3. Pay Attention to What You Bring Indoors

So many indoor air quality problems can be solved by using a bit of common sense.

- Thinking about new paint or carpet? Don't do it until the weather allows you to open the windows and release the volatile organic gases (VOCs) like formaldehyde they produce.
- Are you ready to replace your bed
  instead of ones made from cotton
  proof covers.

- Need a new vacuum cleaner? Purchase one that includes a HEPA air filter instead of a paper bag.

For people with allergies or asthma, indoor air quality is critical to their overall health and comfort. Here are some additional recommendations from the Asthma and Allergy Foundation of America.

4. Check Your Furnace Yearly

You visit the dentist for regular cleanings, you see your primary care doctor for checkups, and you change your car's oil regularly too. It is all called preventative maintenance. Your HVAC system needs regular maintenance too. It's the technician's job to make sure that your system is operating effectively and that it is burning fuel at 100% efficiency so that no carbon monoxide is leaking into your home.

In addition, a clean heating system will save you money on fuel and prolong your furnace's life too.

5. Use a CO2 Indoor Air Quality Monitor

An indoor air quality monitor that measures CO2 levels can be used as an "early warning system" for poor indoor air quality.

A CO2 Monitor like the Aranet4 Pro Indoor Air Quality Monitor can be placed in an office, on a school desk, nightstand, or in a central area of the home. What makes it so helpful is the ability to see your air quality in "real-time".

Are CO2 levels too high? This means your HVAC system isn't working properly, and your air is filled with airborne chemicals, pollutants, and microorganisms that spread colds or can inflame allergies.

Simply put, ask your HVAC contractor to have your system "bring in more fresh air."

Too little CO2 means you have too much fresh air and are wasting heating or cooling energy. A quick and simple way to m

sure you're enjoying the best air quality available is by using an indoor air quality mo

Understanding the importance of carbon dioxide levels and poor indoor air quality is the first step to improving an individuals' overall well being and performance in any home, office, or classroom setting.

CO2 Monitoring is Important Indoors

AR-4PRO

To provide further perspective, the staff at CO2Meter frequently receives e-mails from customers who have implemented CO2 monitors into their indoor space and are surprised by the reading their new CO2 meter has indicated.

They've found that high CO2 levels indoors can have a direct impact on their quality of life. Here are some examples we would like to share:

High CO2 levels indoors in the workplace

V. Jakimov writes, “The moment I powered the Aranet4 PRO a high CO2 level alarm sounded. My CO2 was around ***2,800 ppm.*** I was a bit surprised at first but then realized that my small office gets filled quite fast with breath exhaust carbon dioxide (CO2).”

In a paper published in the journal Er
that people working in buildings with below-average indoor air pollution and carbon dioxide showed better cognitive functioning than workers in offices with typical VOC and C
levels.

Fall asleep at home watching movies

Stephen L. writes, “My friends and I have been surprised at how quickly CO2 builds up in a room full of people. In a basement home theater setup I installed, with six people in a 20’x 20’x 8’ room watching a 2 hour movie, the CO2 concentration went from 400ppm to 2,000ppm by the end of the movie.”

Children sick, tired at school

Ken. C., a science teacher writes, “In one classroom of 30 students after lunch reached CO2 levels of **4,825ppm** with the door closed...We noticed a rise in asthma sufferers needing their inhalers later in the day when CO2 levels were the highest, typically after lunch.

We also found a direct correlation to nausea, and headache complaints when levels were over **2,000ppm**.

Yawning started about **2,500ppm** and progressed to some students just laying their heads down around **3,500ppm**."

According to the EPA, indoor air quality (IAQ) directly impacts student academic performance and health. For example, the Chester School District in Connecticut saw the number of asthma-related health office visits decrease dramatically – from 463 to 256 – in a single year after improving the air quality in their schools. The Hartford school district saw asthma-related incidents decline from 11,334 to 8,929 in one school year.

Tired while driving

David R. writes, “Our studies found carbon dioxide levels rise to over **3,000ppm** from **400ppm** (outdoor air) in 30 minutes in an enclosed automobile with a single passenger.”

In fact, studies show that drowsiness accounts for between 10% and 30% of all automobile accidents and high CO2 levels are known to cause drowsiness. As a result, high-end auto manufacturers now put CO2 sensors in in their car cabins to automatically add fresh air when needed.

Lower concentration in the morning

A study by the military in South Korea attempted to determine the effect of CO2 levels in sleeping barracks on soldiers shooting accuracy. Two platoons of recruits were put in separate barracks: one with the windows and vents open the other with them closed. After a full night sleep, both platoons participated in shooting accuracy tests.

The military was surprised to discover that the soldiers who slept in well-ventilated barracks had statistically improved shooting accuracy. In fact, they were so surprised that they switched the platoons the second night, repeated the tests, and found that the platoon in the well-ventilated barracks performance improved, while the other platoon's performance suffered.

How can I monitor my co2 levels?

There are several methods available to monitor CO2 levels indoors. Here are a few commonly used options:

1. Portable/Desktop CO2 Monitors: Portable or Desktop CO2 monitors are devices are devices that can be carried around different areas of a building to measure CO2 levels in real-time. These monitors typically display the CO2 concentration in parts per million (ppm) and may have additional features such as data logging capabilities. Portable monitors are convenient for spot-checking CO2 levels in various locations within a building.

2. Fixed CO2 Monitors: Fixed CO2 monitors are permanently installed in specific areas of a building, such as offices, classrooms, or HVAC ducts. These sensors continuously monitor CO2 levels and provide ongoing data. Fixed sensors are often connected to a building's automation or control system, enabling real-time monitoring and integration with HVAC systems for ventilation control.

3. Building Management Systems (BMS): Many modern buildings have sophisticated Building Management Systems that can monitor various environmental parameters, including CO2 levels. BMS software can integrate data from multiple sensors throughout the building, allowing facility managers to monitor CO2 levels in different zones and make informed decisions about ve

4. Internet of Things (IoT) Devices: IoT devices are becoming increasingly popular fo monitoring indoor air quality, including CO2 levels. These devices are often comp

wireless, and easy to install. They can communicate data to a central system or cloud platform, providing real-time insights and remote monitoring capabilities.

5. Smart Thermostats: Some smart thermostats on the market include built-in CO2 sensors. These thermostats can monitor CO2 levels along with temperature and humidity, providing information about indoor air quality. They often have user-friendly interfaces or mobile apps, allowing occupants to access and monitor CO2 levels in their immediate surroundings.

It's important to select monitoring methods and devices based on the specific needs and requirements of the building. Factors such as budget, building size, occupancy patterns, and automation capabilities should be considered when choosing the appropriate CO2 monitoring solution. Additionally, regular calibration and maintenance of the monitoring devices are essential to ensure accurate and reliable measurements.

For more information on indoor air quality solutions, contact us today

Resources:

https://www.airthings.com/business/resources/carbon-dioxide-buildings

https://indoor.lbl.gov/publications/co2-monitoring-demand-controlled

https://www.osti.gov/servlets/purl/902450

https://www.usgbc.org/credits/new-construction/v21/eqc1

https://www.neefusa.org/health/asthma/health-impacts-indoor-air-quality

https://www.epa.gov/sites/default/files/2014-08/documents/sick_building_factsheet.pdf

https://www.co2meter.com/collections/indoor-air-quality

https://www.co2meter.com/blogs/news/indoor-air-quality-standards-schools

Tags: Indoor Air Quality

← Older Post

CO2Meter eBooks

Categories

Agriculture

Ammonia (NH3)

Beverage

Breweries

Carbon Dioxide (CO2)

Carbon Monoxide (CO)

Case Studies

Corporate

Cryogenics

Data Logger

Ebooks

Fire Suppression

Free Gaslab Software

HVAC

Indoor Air Quality

Industrial

Medical

Methane (CH4)

Modified Packaging (MAP)

Multi-Gas

Mushroom Farming

NBIC

NFPA

OSHA

Oxygen (O2)

Poultry

Restaurants

Safety

Scientific

Sensor

Welding

Wineries

Still need Help? Talk to an Expert.

Call us at 877.678.4259.

We'll be happy to help you find the right product!

Shop

Products

Applications

Reviews

Video Testimonials

Software Downloads

Support

Case Support

FAQ

Returns

Track Order

Terms and Conditions

Company Info

Contact Us

About Us

Careers

Privacy Policy

Newsletter Signup

Contact

CO2Meter.com
105 Runway Drive
Ormond Beach, FL
32174 USA
(877) 678-4259
M-F 8:30am-5pm EST