

# Independent Guide

## What do I need to know about Carbon dioxide?



Independent workplace compliance

### What is carbon dioxide and how is it generated?

Carbon dioxide (CO<sub>2</sub>) is a non-flammable, colourless, odourless gas. The main generators of carbon dioxide in the workplace are human beings. The gas is produced as a by-product of breathing.

### How does a build-up of carbon dioxide occur in the workplace?

Carbon dioxide levels can be a particular problem in naturally ventilated buildings in the winter. People are reluctant to open the windows during these periods as it is cold outside and they do not wish to sit in a draught. However, this means that insufficient outside (fresh) air is being introduced into the workplace to dilute the gas. Outside air is required in all types of premises, whether they are naturally or artificially ventilated. It ensures that there is sufficient air provided for respiration, removes excess heat and dilutes/removes airborne impurities such as carbon dioxide. Sometimes, office refurbishments can lead to a build-up of carbon dioxide in the workplace. If partitions have been moved to accommodate more desks or alter the layout of an office which contradicts the original building design, "dead zones" can be created where insufficient outside air is being supplied to certain areas.

### What is the guidance/legislation concerning carbon dioxide levels?

Regulation 6 of the Workplace (Health, Safety and Welfare) Regulations states that: "Effective and suitable provision shall be made to ensure that every enclosed workplace is ventilated by a sufficient quantity of fresh or purified air." The guidance recommends that "fresh air supply rates should not normally fall below 5 to 8 litres per second, per occupant." In addition to these Regulations, the HSE occupational exposure limit for carbon dioxide in EH40 is 5000ppm (parts per million). However, a more realistic recommendation has been published by the BSRIA (Building Services Research and Information Association) of 800ppm over an eight hour time-weighted average. In our experience, levels of up to 1000ppm can be reached before people begin to experience problems with lethargy and headaches. Carbon dioxide levels are often substantially higher in buildings than the 350-400ppm typically found outdoors. Indoors values of 600ppm are considered very good. But that will depend on how many people inhabit a room and how many times per hour its air is exchanged with outdoor air through ventilation.

### What problems are associated with carbon dioxide?

Aside from being an indicator of ventilation, carbon dioxide has a significant impact on your body with regard to ambient comfort. When your brain detects certain levels of carbon dioxide in the bloodstream it increases your respiration rate, which, in turn, generates heat internally. If levels exceed 1000ppm some people can start to feel lethargic and may suffer from headaches. At extremely high levels (i.e. up to or over 5000ppm) other symptoms such as breathlessness, visual impairment, sweating and even tremor or loss of consciousness may manifest themselves. However, most of the time the levels of carbon dioxide present in a building will not have any effect on human health.

### How can I measure the levels of carbon dioxide in my building?

The suitability of ventilation rates in a building can easily be assessed by measuring levels of carbon dioxide as part of an indoor air quality or workplace comfort audit. As with all workplace audits, it is important to ensure that the auditor is both competent and independent. The auditor should not be connected to any other product, service or company, to ensure that the results of their audit are unbiased and will not be used as a means to sell another product or service.

### What can I do if carbon dioxide levels are found to be high?

If carbon dioxide levels exceed 1000ppm, the ventilation rates to that area of the building may need to be increased. In naturally ventilated buildings this will mean opening more windows. In artificially ventilated buildings it could require an adjustment in the ventilation system or getting the right mix of outside air and re-circulated air. Sometimes the build-up can be caused by a maintenance-related problem, for example where fire dampers inside the ventilation shafts have shut, therefore preventing "fresh" air from entering an office area. Before any refurbishment takes place it is important to consider where the supply and extract points are located, before any alteration is made to the office layout. This is important, not only because carbon dioxide levels can accumulate, but also because new furnishings can generate Volatile Organic Compounds (VOCs). VOCs, such as formaldehyde, need to be removed effectively to avoid a build-up of the gases which can, in high quantities, affect human health. It is also important to consider the number of people which an area was originally designed to accommodate.

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