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| ASHRAE Technical FAQ |
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| ID  | 35 |
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| Question  | What is the allowable level of carbon dioxide (CO2) in an occupied space? |
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| LongAnswer  | ASHRAE Standards do not include a CO2 limit in ASHRAE Standards. An ASHRAE position document, [Indoor Carbon Dioxide](https://www.ashrae.org/about/position-documents), includes the following positions:* Indoor CO2 concentrations do not provide an overall indication of IAQ, but they can be a useful tool in IAQ assessments if users understand the limitations in these applications.
* Existing evidence for direct impacts of CO2 on health, well-being, learning outcomes, and work performance at commonly observed indoor concentrations is inconsistent, and therefore does not currently justify changes to ventilation and IAQ standards, regulations, or guidelines.
* The use of indoor CO2 measurements to assess and control the risk of airborne disease transmission must account for the definition of acceptable risk, the type of space and its occupancy, and differences in CO2 and infectious aerosol emissions and their subsequent fate and transport.

[ASHRAE Standard 62.1-2016](https://www.techstreet.com/ashrae/standards/ashrae-62-1-2016?product_id=1912838), “*Ventilation for Acceptable Indoor Air Quality*”, in an Appendix D, *Summary of Selected Air Quality Guidelines,* notes thatCO2 at very high concentrations (e.g. greater than 5000 ppm) can pose a health risk. However, in most buildings, concentrations almost never rise to these levels. CO2 at the concentrations commonly found in buildings is not a direct health risk, but CO2 concentrations can be used as an indicator of occupant odors (odorous bioeffluents) and occupant acceptance of these odors. At the activity levels found in typical office buildings, steady-state CO2 concentrations of about 700 ppm above outdoor air levels indicate an outdoor air ventilation rate of about 7.5 L/s/person (15 cfm/person). Laboratory and field studies have shown that this rate of ventilation will dilute odors from human bioeffluents to levels that will satisfy a substantial majority (about 80%) of unadapted persons (visitors) in a space. CO2 concentrations in outdoor air typically range from 300 to 500 ppm. Thus indoor CO2 concentrations of 1000 to 1200 ppm in spaces housing sedentary people is an indicator that a substantial majority of visitors entering the space will be satisfied with respect to human bioeffluents (body odor). Note however that CO2 concentration is not a good indicator of the concentration and occupant acceptance of other indoor contaminants, such as volatile organic compounds off-gassing from furnishings and building materials. Thus CO2 concentration is not a reliable indicator of overall building air quality.A more detailed discussion of this relationship between CO2 concentrations and the perception of bioeffluents, as well as the use of indoor CO2 to estimate building ventilation rates, is contained in ASTM Standard D6245.Additional information on this subject can be found in [ASHRAE Standard 62.1-2016](https://www.techstreet.com/ashrae/standards/ashrae-62-1-2016?product_id=1912838), "Ventilation for Acceptable Indoor Air Quality", plus [ASHRAE BOD approved addenda](http://www.ashrae.org/standards-research--technology/standards-addenda). This standard specifies outside air ventilation rates and maximum levels of indoor contaminants and other chemicals for acceptable indoor air quality.Copies of the standard, the latest addenda, and other publications may be purchased on-line at our website, [www.ashrae.org](http://www.ashrae.org) or by calling 1-800-527-4723 in the USA and Canada or 1-404-636-8400 worldwide. Addenda to the standards may be downloaded for free. |
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| ASHRAE Pubs  | [ASHRAE Standard 62.1-2016](https://www.techstreet.com/ashrae/standards/ashrae-62-1-2016?product_id=1912838), Appendix D.[Indoor Carbon Dioxide ASHRAE Position Document](https://www.ashrae.org/about/position-documents)  |
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| Topic References  | Indoor Air ContaminantsCarbon Dioxide |
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|  | Cognizant ASHRAE Committees | Refer to Organization |
| 1 | [TC 4.3](http://tc0403.ashraetcs.org/) | [ASTM](http://www.astm.org) |
| 2 | SSPC 62.1 |  |
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