



Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation¹

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1. Scope

1.1 This guide describes how measured values of indoor carbon dioxide (CO_2) concentrations can be used in evaluations of indoor air quality and building ventilation.

1.2 This guide describes the determination of CO_2 generation rates from people as a function of body size and level of physical activity.

1.3 This guide describes the experimentally-determined relationship between CO_2 concentrations and the acceptability of a space in terms of human body odor.

1.4 This guide describes the following uses of indoor CO_2 concentrations to evaluate building ventilation—mass balance analysis to determine the percent outdoor air intake at an air handler, the tracer gas decay technique to estimate whole building air change rates, and the constant injection tracer gas technique at equilibrium to estimate whole building air change rates.

1.5 This guide discusses the use of continuous monitoring of indoor and outdoor CO_2 concentrations as a means of evaluating building ventilation and indoor air quality.

1.6 This guide discusses some concentration measurement issues, but it does not include or recommend a method for measuring CO_2 concentrations.

1.7 This guide does not address the use of indoor CO_2 to control outdoor air intake rates.

1.8 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards*:²

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

D3249 Practice for General Ambient Air Analyzer Procedures

E741 Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution

2.2 *Other Documents*:

ASHRAE Standard 62.1 Ventilation for Acceptable Indoor Air Quality³

3. Terminology

3.1 *Definitions*—For definitions and terms used in this guide, refer to Terminology **D1356**.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *air change rate, n*—the total volume of air passing through a zone to and from the outdoors per unit time, divided by the volume of the zone (s^{-1} , h^{-1}).⁴

3.2.2 *bioeffluents, n*—gases emitted by people as a product of their metabolism that can result in unpleasant odors.

3.2.3 *single-zone, n*—an indoor space, or group of spaces, wherein the CO_2 concentration is uniform and that only exchanges air with the outdoors.

4. Summary of Guide

4.1 When investigating indoor air quality and building ventilation, a number of tools are available. One such tool is the measurement and interpretation of indoor and outdoor CO_2 concentrations. Using CO_2 concentrations to evaluate building indoor air quality and ventilation requires the proper use of the procedures involved, as well as consideration of several factors related to building and ventilation system configuration, occupancy patterns, non-occupant CO_2 sources, time and location

¹ This guide is under the jurisdiction of ASTM Committee **D22** on Air Quality and is the direct responsibility of Subcommittee **D22.05** on Indoor Air.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329.

⁴ A common way of expressing air change rate units is h^{-1} = air changes per hour.