



Designation: D 6245 – 98 (Reapproved 2002)

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

This standard is issued under the fixed designation D 6245; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

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 *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

D 1356 Terminology Relating to Sampling and Analysis of Atmospheres

D 3249 Practice for General Ambient Air Analyzer Procedures

E 741 Test Method for Determining Air Change in a Single Zone by Means of Tracer Gas Dilution

2.2 Other Documents

ASHRAE Standard 62 Ventilation for Acceptable Indoor Air Quality³

3. Terminology

3.1 **Definitions**—For definitions and terms used in this guide, refer to Terminology D 1356.

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 to understand the building being studied. 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 of air sampling, and instrumentation for concentration measurement. This guide discusses ways in which CO_2 concentrations can be used to evaluate building indoor air quality and ventilation.

4.2 Section 6 discusses the rate at which people generate CO_2 and the factors that affect this rate.

4.3 Section 7 discusses the use of indoor concentrations of CO_2 as an indicator of the acceptability of a space in terms of perceptions of human body odor.

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

Current edition approved March 10, 1998. Published May 1998.

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 ach = air changes per hour.

Astm Standards On Indoor Air Quality 2002

William Popendorf



Astm Standards On Indoor Air Quality 2002:

Indoor Air Pollution Peter Pluschke, 2004-09-27 Indoor Air Pollution has become a major topic in environmental research and health. Most people spend more than 80% of their time in buildings and are exposed to a broad range of pollutants from indoor sources such as building materials, furniture, carpets and textiles, heating and cooking, household and consumer products etc. The volume provides a comprehensive review of the major indoor air pollutants: volatile organic compounds, biocides, indoor particles and fibres, combustion products and micro organisms and their metabolites. Sources and sinks of air pollutants in indoor environments and their chemistry are distinctly different from ambient air pollution even though the latter may influence indoor air quality. Adsorption and desorption processes, the pollutant source dynamics, gas phase reactions and kinetics, including the fate and final chemical destiny of chemically unstable intermediate compounds, are topics of scientific research as well as the evaluation of their sensory impact and irritation potential. Guidelines for assessing indoor pollution and a broad range of analytical methods have been recently developed and are reviewed by internationally renowned scientists. The specific characteristics of indoor air pollution in developing countries due to the widespread use of open fires for cooking, heating and lighting are analysed as well as the Chinese strategies to address the growing pollution problems by air pollution in its modern building stock.

Industrial Hygiene Control of Airborne Chemical Hazards

William Popendorf, 2006-05-15 Do you need guidelines for choosing a substitute organic solvent that is safer to use? Do you need an effective, cheap but perhaps temporary way to reduce exposures before you can convince your employer to spend money on a long term or more reliable solution? Do you need information about local exhaust ventilation or personal protective equipment like respirators and gloves? *Industrial Hygiene Control of Airborne Chemical Hazards* provides the answers to these questions and more. Science based and quantitative, the book introduces methods for controlling exposures in diverse settings, focusing squarely on airborne chemical hazards. It bridges the gap between existing knowledge of physical principles and their modern application with a wealth of recommendations, techniques and tools accumulated by generations of IH practitioners to control chemical hazards. Provides a unique comprehensive tool for facing the challenges of controlling chemical hazards in the workplace. Although William Popendorf has written the book at a fundamental level, he assumes the reader has some experience in science and math as well as in manufacturing or other work settings with chemical hazards but is inexperienced in the selection, design, implementation or management of chemical exposure control systems. Where the book is quantitative, of course, there are lots of formulae, but in general, the author avoids vague notation and long derivations.

Handbook of Industrial and Hazardous Wastes Treatment Lawrence K. Wang, Yung-Tse Hung, Howard H.

Lo, Constantine Yapijakis, 2004-06-29 Presenting effective, practicable strategies modeled from ultramodern technologies and framed by the critical insights of 78 field experts, this vastly expanded Second Edition offers 32 chapters of industry and waste specific analyses and treatment methods for industrial and hazardous waste materials from explosive wastes to landfill.

leachate to water *Chemistry, Emission Control, Radioactive Pollution and Indoor Air Quality* Nicolas Mazzeo, 2011-07-27 The atmosphere may be our most precious resource Accordingly the balance between its use and protection is a high priority for our civilization While many of us would consider air pollution to be an issue that the modern world has resolved to a greater extent it still appears to have considerable influence on the global environment In many countries with ambitious economic growth targets the acceptable levels of air pollution have been transgressed Serious respiratory disease related problems have been identified with both indoor and outdoor pollution throughout the world The 25 chapters of this book deal with several air pollution issues grouped into the following sections a air pollution chemistry b air pollutant emission control c radioactive pollution and d indoor air quality *Damp Indoor Spaces and Health* Committee on Damp Indoor Spaces and Health, 2004-08-31 Almost all homes apartments and commercial buildings will experience leaks flooding or other forms of excessive indoor dampness at some point Not only is excessive dampness a health problem by itself it also contributes to several other potentially problematic types of situations Molds and other microbial agents favor damp indoor environments and excess moisture may initiate the release of chemical emissions from damaged building materials and furnishings This new book from the Institute of Medicine examines the health impact of exposures resulting from damp indoor environments and offers recommendations for public health interventions *Damp Indoor Spaces and Health* covers a broad range of topics The book not only examines the relationship between damp or moldy indoor environments and adverse health outcomes but also discusses how and where buildings get wet how dampness influences microbial growth and chemical emissions ways to prevent and remediate dampness and elements of a public health response to the issues A comprehensive literature review finds sufficient evidence of an association between damp indoor environments and some upper respiratory tract symptoms coughing wheezing and asthma symptoms in sensitized persons This important book will be of interest to a wide ranging audience of science health engineering and building professionals government officials and members of the public

Fundamentals of HVAC Control Systems Robert McDowall, 2009-08-20 A hard copy companion to the eLearning course that serves as a practical guide to the principles and characteristics of controls and how to apply them in the use selection specification and design of controls systems **Fundamentals of HVAC Control Systems** Steven T. Taylor, Ross Montgomery, Robert McDowall, Heating Ventilation and Air Conditioning HVAC control systems are omnipresent in modern buildings This book is an introduction to all those involved in the specification design manufacture installation operation or maintenance of these systems The book explains Control theory and how to evaluate select position and sequence the appropriate type of control The electrical knowledge needed to understand controls and the use of electrical circuit drawings The various types of valves and dampers and their selection installation and operation Terminology and attributes of sensors the selection of moisture sensors pressure flow and auxiliary devices Self powered and system powered controls Electric controls control diagrams and control logic The components of pneumatic systems and control applications diagrams Wiring

conventions application specific electronic controllers and how to use them in HVAC applications The use of written specifications schedules and drawings to clearly identify what is to be installed how it is to be installed and how it is expected to operate Direct Digital Controls DDC components their inputs and outputs and the programming of DDC routines DDC Networks and Protocols DDC Specification Installation and Commissioning After completing this course you will understand Control theory and how to evaluate select position and sequence the appropriate type of control The electrical knowledge needed to understand controls and the use of electrical circuit drawings The various types of valves and dampers and their selection installation and operation Terminology and attributes of sensors the selection of moisture sensors pressure flow and auxiliary devices Self powered and system powered controls Electric controls control diagrams and control logic The components of pneumatic systems and control applications diagrams Wiring conventions application specific electronic controllers and how to use them in HVAC applications The use of written specifications schedules and drawings to clearly identify what is to be installed how it is to be installed and how it is expected to operate Direct Digital Controls DDC components their inputs and outputs and the programming of DDC routines DDC Networks and Protocols DDC Specification Installation and Commissioning

Air Pollution Jeremy Colls,Abhishek Tiwary,2017-07-12 A one stop comprehensive textbook covering the three essential components of air pollution science The Third Edition has been updated with the latest developments especially the inclusion of new information on the role of air pollutants in climate change The authors give greater coverage to the developing economies around the world where air pollution problems are on the rise The Third Edition continues to cover a wide range of air quality issues retaining a quantitative perspective Topics covered include gaseous and particulate air pollutants measurement techniques meteorology and dispersion modelling mobile sources indoor air effects on plants materials humans and animals Moving away from classical toxic air pollutants there is a chapter on climate change and another on the depletion of stratospheric ozone A special feature of this new edition is the inclusion of a fresh chapter on air pollution mitigation by vegetation mainly its role in maintaining a sustainable urban environment Recommended for upper level undergraduate and postgraduate courses specialising in air pollution both for environmental scientists and engineers The new material included in the Third Edition extends its use by practitioners in consultancies or local authorities

Industrial Hygiene Control of Airborne Chemical Hazards, Second Edition William Popendorf,2019-06-26 Are you a practicing occupational hygienist wondering how to find a substitute organic solvent that is safer to use than the hazardous one your company is using Chapter 6 is your resource Are you a new hygienist looking for an alternative technology as a nonventilation substitute for an existing hazard Chapter 8 is your resource Are you looking for an overview of ventilation Chapters 10 and 11 are your resource Are you an industrial hygiene student wanting to learn about local exhaust ventilation Chapters 13 through 16 are your resource Are you needing to learn about personal protective equipment and respirators Chapters 21 and 22 are your resources This new edition brings all of these topics and more right up to date with

new material in each chapter including new governmental regulations While many of the controls of airborne hazards have their origins in engineering this author has been diligent in explaining concepts writing equations in understandable terms and covering the topics of non ventilation controls both local exhaust and general ventilation and receiver controls at the level needed by most IHs without getting too advanced Taken as a whole this book provides a unique comprehensive tool to learn the challenging yet rewarding role that industrial hygiene can play in controlling airborne chemical hazards at work Most chapters contain a set of practice problems with the solutions available to instructors Features Written for the novice industrial hygienist but useful to prepare for ABIH certification Explains engineering concepts but requires no prior engineering background Includes specific learning goals that differentiate the depth of learning appropriate to each topic within the fuller information and explanations provided for each chapter Contains updated governmental regulations and abundant references Presents a consistent teaching philosophy and approach throughout the book Deals with both ventilation and non ventilation controls

Viewpoints and Controversies in Sensory Science and Consumer Product Testing Howard R. Moskowitz,Alejandra M. Muñoz,Maximo C. Gacula, Jr.,2008-06-02 The authors skillfully present different approaches to the same problem and even different ways to look at the same type of data If you have ever been stumped by a controversy in product assessment the design of studies or the analysis of data you will find the answer in this book

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