

Ashrae Indoor Air Quality Guide

Indoor Air Quality HandbookASHRAE Laboratory Design GuideManaging Indoor Air Quality Fifth EditionResidential Ventilation Handbook: Ventilation to Improve Indoor Air QualityHVAC Design Manual for Hospitals and ClinicsManaging Indoor Air Quality, Fifth EditionASHRAE Design Guide for Dedicated Outdoor Air SystemsIndoor Air QualityIndoor Air Quality and HVAC SystemsForensic EngineeringWHO Guidelines for Indoor Air QualityASHRAE Greenguide2013ASHRAE HandbookIndoor Air QualityManaging Indoor Air Quality, Fifth EditionHVAC Equations, Data, and Rules of Thumb, Third EditionCold-Climate Buildings Design GuideMicrobiomes of the Built EnvironmentDistrict Cooling GuideGravimetric and Dust-spot Procedures for Testing Air-cleaning Devices Used in General Ventilation for Removing Particulate MatterSystem Performance Evaluation and Design Guidelines for Displacement VentilationIAQ Guidelines for Occupied Buildings Under Construction 2nd EdASHRAE Design Guide for CleanroomsStandard 62.2 User's Manual Based on ANSI/ASHRAE Standard 62.2-2016, Ventilation and Acceptable Indoor Air Quality in Residential BuildingsBuilding Air Quality62.1 User's ManualWHO Guidelines for Indoor Air QualityGreen SchoolsClimate Change, the Indoor Environment, and HealthDampers and Airflow ControlHVAC Duct Construction Standards - Metal and Flexible 3rd EdASHRAE Design Guide for Low-to Mid-rise Multifamily Residential BuildingsASHRAE Design Guide for Tall, Supertall, and Megatall Building SystemsResidential Indoor Air Quality GuideAir

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Distribution in BuildingsASHRAE Laboratory Design GuidePerformance
Measurement Protocols for Commercial BuildingsMechanical and Electrical
Equipment for BuildingsDamp Buildings, Human Health, and HVAC DesignIndoor
Pollutants

Indoor Air Quality Handbook

Microbial pollution is a key element of indoor air pollution. It is caused by hundreds of species of bacteria and fungi, in particular filamentous fungi (mould), growing indoors when sufficient moisture is available. This document provides a comprehensive review of the scientific evidence on health problems associated with building moisture and biological agents. The review concludes that the most important effects are increased prevalences of respiratory symptoms, allergies and asthma as well as perturbation of the immunological system. The document also summarizes the available information on the conditions that determine the presence of mould and measures to control their growth indoors. WHO guidelines for protecting public health are formulated on the basis of the review. The most important means for avoiding adverse health effects is the prevention (or minimization) of persistent dampness and microbial growth on interior surfaces and in building structures. [Ed.]

ASHRAE Laboratory Design Guide

Managing Indoor Air Quality Fifth Edition

"Provides a summary of what is understood within ASHRAE about dampness-related health risks in buildings along with suggestions for HVAC system designers that can help avoid such risks as well as a simple and easily recognizable description of dampness that is sufficient to increase the probability of negative health effects and practical quantitative tools and techniques that can alert managers to the risk of a building or an indoor space becoming damp to an extent that affects health in the future"--

Residential Ventilation Handbook: Ventilation to Improve Indoor Air Quality

Written in easy-to-understand, non-technical terms, this book can be both a ready reference and a training guide. Covering each type of indoor air hazard, the author explains the basics of proper ventilation and the relationship of the HVAC system to indoor air quality. He examines fundamental procedures for maintaining good air quality, including filtration, control of humidity and moisture, and duct cleaning.

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A full chapter is devoted to recent developments and procedures for controlling toxic mold. Case studies, an HVAC glossary, and several helpful directories are also included. The guide provides a comprehensive account of indoor air quality hazards, their sources, and appropriate solutions.

HVAC Design Manual for Hospitals and Clinics

This book presents WHO guidelines for the protection of public health from risks due to a number of chemicals commonly present in indoor air. The substances considered in this review, i.e. benzene, carbon monoxide, formaldehyde, naphthalene, nitrogen dioxide, polycyclic aromatic hydrocarbons (especially benzo[a]pyrene), radon, trichloroethylene and tetrachloroethylene, have indoor sources, are known in respect of their hazardousness to health and are often found indoors in concentrations of health concern. The guidelines are targeted at public health professionals involved in preventing health risks of environmental exposures, as well as specialists and authorities involved in the design and use of buildings, indoor materials and products. They provide a scientific basis for legally enforceable standards.

Managing Indoor Air Quality, Fifth Edition

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This newly revised and updated practical desk reference is structured to serve as a guide and information resource-both on treating existing indoor air problems effectively, and on preventing costly IAQ problems from occurring in the first place. Finding solutions to indoor air quality problems is often a complex, multi-disciplined endeavor. A single discipline approach from the environmental engineer, the industrial hygienist, or the medical doctor, unfortunately tends to narrow both the control and the treatment options. This book cuts across these professions to offer those concerned with the total facility, a broader, more comprehensive approach to managing indoor air quality and mitigating indoor air quality problems. Topics covered also include updated ASHRAE standards and information, expanded discussion of greening and sustainability, building security and mold-related issues, current diagnostics and remediation practices, and the latest information on filtering.

ASHRAE Design Guide for Dedicated Outdoor Air Systems

The District Cooling Guide provides design guidance for all major aspects of district cooling systems, including central chiller plants, chilled-water distribution systems, and consumer interconnection. It draws on the expertise of an extremely diverse international team with current involvement in the industry and hundreds of years of combined experience.

Indoor Air Quality

Air Distribution in Buildings is a concise and practical guide to air distribution system design and managing air conditioning systems in buildings. Making use of 40 years of experience in the design of air conditioning and ventilations systems, and other electromechanical services, this structured reference for built environment engineering offers in-depth coverage of air distribution technology. The text brings together a wide range of information and offers technical guidance on the design, calculation, and efficient operation of air distribution in buildings. The text highlights the special characteristics of air distribution in individual spaces. It presents the basic and fundamental concepts of air distribution as it relates to grilles and outlets, room space, and buildings. It focuses on air distribution systems in large buildings, starting with simple rooms and then moving on to more complex configurations. It also sums up the latest standards and best practices in air conditioning engineering. Includes knowledge of the new trends in buildings' air distribution Provides systematic analyses of the air flow regimes, heat transfer, and relative humidity in a collection of special built environments Presents energy analyses of the air conditioning systems for operating theaters and sporting facilities in unusual and severe climatic conditions Offers a description of flow characteristics in archeological monuments with emphasis on combating excessive moisture Introduces examples of very dense occupancy built environments, moisture sensitive environments, and open space air conditioning

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Details advanced treatment of flow characterization in large public buildings This text serves as an ideal resource for air conditioning engineers, contractors, and consultants. It also benefits mechanical and architectural engineering students.

Indoor Air Quality and HVAC Systems

"Provides information on green-building design. Concerned with sustainable, high-performance projects"--

Forensic Engineering

This standard establishes procedures to measure the ability of air-cleaning devices to remove dust as they become loaded with standard synthetic dust. The dust-removal performance is measured in two ways: first by the percentage of the weight of the synthetic dust captured by the filter (ASHRAE weight arrestance) and second by comparing the blackening of targets both upstream and downstream of the air-cleaning device using ambient atmospheric dust (ASHRAE dust-spot efficiency). The procedures in this standard do not measure the ability of the air cleaner to remove particles of specific diameters. This standard is not intended for testing air cleaners exhibiting ASHRAE dust-spot efficiencies of greater than 98%.

WHO Guidelines for Indoor Air Quality

This book presents system performance evaluation, and includes a 10-step design guideline for displacement ventilation systems for U.S. buildings. These design guidelines present two important models: 1) to calculate the temperature difference between the head and the foot level of an occupant; and 2) one to determine the ventilation effectiveness at the breathing level. The book notes that: A displacement ventilation system can provide a thermally comfortable indoor environment at a high cooling load through careful design. The indoor air quality in a space with displacement ventilation is better if the contaminant sources are associated with the heat sources. The displacement ventilation system can also save energy but requires a separate heating system if it is applied to building perimeter zones. 6 x 9, soft cover.

ASHRAE Greenguide

Finding solutions to indoor air quality problems is often a complex, multifaceted endeavor. This practical desk reference serves as a guide and information resource – both on treating existing indoor air problems effectively – and on preventing costly IAQ problems from occurring in the first place. A single discipline approach unfortunately tends to narrow both the control and the treatment options. This

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book cuts across professions to offer those concerned with the total facility a broader, more comprehensive approach to managing indoor air quality and mitigating indoor air quality problems. The fifth edition is extensively updated and edited in response to the rapid pace of changes and advances in the IAQ industry.

2013 ASHRAE Handbook

"Provides in-depth design recommendations and proven, cost effective, and reliable solutions for health care HVAC design that provide low maintenance cost and high reliability based on best practices from consulting and hospital engineers with decades of experience in the design, construction, and operation of health care facilities"--

Indoor Air Quality

* Tackles the complex environmental issue of Indoor Air Quality (IAQ) for industrial hygienists, HVAC engineers, architects and anyone else concerned with the air quality of interiors * Infused with charts, tables, and all the major formulas and calculations necessary to monitor and characterize a particular environment * Includes all relevant codes, standards and guidelines

Managing Indoor Air Quality, Fifth Edition

Discusses pollution from tobacco smoke, radon and radon progeny, asbestos and other fibers, formaldehyde, indoor combustion, aeropathogens and allergens, consumer products, moisture, microwave radiation, ultraviolet radiation, odors, radioactivity, and dirt and discusses means of controlling or eliminating them.

HVAC Equations, Data, and Rules of Thumb, Third Edition

"This book represents the most complete guidance on the design, installation, and operation and management of DOAS in nonresidential applications. With this book, any HVAC designer will be able to optimally incorporate a DOAS into their design. Architectural designers, building developers and owners, maintenance professionals, students, teachers, and researchers may also find the contents useful"--

Cold-Climate Buildings Design Guide

Microbiomes of the Built Environment

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People's desire to understand the environments in which they live is a natural one. People spend most of their time in spaces and structures designed, built, and managed by humans, and it is estimated that people in developed countries now spend 90 percent of their lives indoors. As people move from homes to workplaces, traveling in cars and on transit systems, microorganisms are continually with and around them. The human-associated microbes that are shed, along with the human behaviors that affect their transport and removal, make significant contributions to the diversity of the indoor microbiome. The characteristics of "healthy" indoor environments cannot yet be defined, nor do microbial, clinical, and building researchers yet understand how to modify features of indoor environments—such as building ventilation systems and the chemistry of building materials—in ways that would have predictable impacts on microbial communities to promote health and prevent disease. The factors that affect the environments within buildings, the ways in which building characteristics influence the composition and function of indoor microbial communities, and the ways in which these microbial communities relate to human health and well-being are extraordinarily complex and can be explored only as a dynamic, interconnected ecosystem by engaging the fields of microbial biology and ecology, chemistry, building science, and human physiology. This report reviews what is known about the intersection of these disciplines, and how new tools may facilitate advances in understanding the ecosystem of built environments, indoor microbiomes, and effects on human health and well-being. It offers a research agenda to generate the information needed so that stakeholders

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with an interest in understanding the impacts of built environments will be able to make more informed decisions.

District Cooling Guide

"A guide to assist designers, contractors, and engineers in constructing and maintaining buildings in cold-climate environments. Provides practical advice on the unique challenges faced when trying to maintain human comfort and energy-efficiency in cold, subarctic, and arctic climates"--

Gravimetric and Dust-spot Procedures for Testing Air-cleaning Devices Used in General Ventilation for Removing Particulate Matter

The definitive guide to the design of environmental control systems for buildings—now updated in its 13th Edition Mechanical and Electrical Equipment for Buildings is the most widely used text on the design of environmental control systems for buildings—helping students of architecture, architectural engineering, and construction understand what they need to know about building systems and controlling a building's environment. With over 2,200 drawings and photographs, this 13th Edition covers basic theory, preliminary building design guidelines, and

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detailed design procedure for buildings of all sizes. It also provides information on the latest technologies, emerging design trends, and updated codes. Presented in nine parts, Mechanical and Electrical Equipment for Buildings, Thirteenth Edition offers readers comprehensive coverage of: environmental resources; air quality; thermal, visual, and acoustic comfort; passive heating and cooling; water design and supply; daylighting and electric lighting; liquid and solid waste; and building noise control. This book also presents the latest information on fire protection, electrical systems; and elevator and escalator systems. This Thirteenth Edition features: Over 2,200 illustrations, with 200 new photographs and illustrations All-new coverage of high-performance building design Thoroughly revised references to codes and standards: ASHRAE, IES, USGBC (LEED), Living Building Challenge, WELL Building Standard, and more Updated offering of best-in-class ancillary materials for students and instructors available via the book's companion website Architect Registration Examination® (ARE®) style study questions available in the instructor's manual and student guide Mechanical and Electrical Equipment for Buildings, has been the industry standard reference that comprehensively covers all aspects of building systems for over 80 years. This Thirteenth Edition has evolved to reflect the ever-growing complexities of building design, and has maintained its relevance by allowing for the conversation to include "why" as well as "how to."

System Performance Evaluation and Design Guidelines for

Displacement Ventilation

The indoor environment affects occupants' health and comfort. Poor environmental conditions and indoor contaminants are estimated to cost the U.S. economy tens of billions of dollars a year in exacerbation of illnesses like asthma, allergic symptoms, and subsequent lost productivity. Climate change has the potential to affect the indoor environment because conditions inside buildings are influenced by conditions outside them. Climate Change, the Indoor Environment, and Health addresses the impacts that climate change may have on the indoor environment and the resulting health effects. It finds that steps taken to mitigate climate change may cause or exacerbate harmful indoor environmental conditions. The book discusses the role the Environmental Protection Agency (EPA) should take in informing the public, health professionals, and those in the building industry about potential risks and what can be done to address them. The study also recommends that building codes account for climate change projections; that federal agencies join to develop or refine protocols and testing standards for evaluating emissions from materials, furnishings, and appliances used in buildings; and that building weatherization efforts include consideration of health effects. Climate Change, the Indoor Environment, and Health is written primarily for the EPA and other federal agencies, organizations, and researchers with interests in public health; the environment; building design, construction, and operation; and climate issues.

IAQ Guidelines for Occupied Buildings Under Construction 2nd Ed

ASHRAE Design Guide for Cleanrooms

"Provides three levels of standardized protocols for assessing building performance that identify what, how, and how often to measure in six performance categories: energy, water, thermal comfort, indoor air quality, lighting, and acoustics. Such protocols give feedback when performance does not match design intent and lend credibility to performance claims"--Provided by publisher.

Standard 62.2 User's Manual Based on ANSI/ASHRAE Standard 62.2-2016, Ventilation and Acceptable Indoor Air Quality in Residential Buildings

"Addresses residential dwelling units covered by ASHRAE Standard 62.2-2016, providing guidance on best practices for design, construction, maintenance, and operation of single-family and multifamily dwellings to maximize IAQ and information and tools that residents, home designers, and builders can use to integrate IAQ while addressing budget constraints and functional requirements"--

Building Air Quality

Provides the latest information about indoor air quality problems and how to prevent and correct them. Packed with valuable information on how to: develop an indoor air quality building profile; create an indoor air quality management plan; identify causes and solutions to problems as they occur, and identify appropriate control strategies. Special sections cover: air quality sampling; heating, ventilating, and air conditioning systems; mold and moisture problems, and much more. In looseleaf binder with tabbed dividers.

62.1 User's Manual

Indoor Air Quality and HVAC Systems is a practical guide for understanding the relationship between the design, installation, operation, and maintenance of HVAC systems and achieving indoor air quality (IAQ). The book describes the individual components of HVAC systems and the role each plays in maintaining good indoor air quality. It also identifies the techniques available for evaluating the performance characteristics of ventilation systems (including the use of carbon dioxide monitors and sulfur hexafluoride tracer testing equipment). Other topics discussed include the determination of pathways of air movement through buildings and understanding pressure relationships, ventilation effectiveness, and

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efficiency. The book concludes with an overview of sources of air contaminants to be concerned about when performing an IAQ evaluation. Indoor Air Quality and HVAC Systems provides critical information for industrial hygienists, HVAC contractors and engineers, and building owners and managers.

WHO Guidelines for Indoor Air Quality

This is a practical, user-friendly guide to the identification and assessment of indoor air contaminants that contribute to building related illness in commercial buildings, institutions, and residences. The third edition covers basic concepts and details various approaches and up-to-date analytical methods, and it addresses some of the more recent, as well as less common, concerns on air pollutants. All chapters will be updated and also includes one completely new chapter on Inhalable Airborne Particles. All updates adhere to the latest National Ambient Air Quality Standards and other active standards.

Green Schools

THE DEFINITIVE COMPANION TO STANDARD 62.2 This companion guide provides detailed information on the requirements of Standard 62.2-2016, and includes tables, illustrations, and examples to aid users in providing for acceptable indoor air

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quality in residential systems. The provisions of Standard 62.2 address mechanical and natural ventilation as well as air leakage in these buildings, and this user's manual provides concrete examples on how to apply the criteria set out by the standard. Standard 62.2 User's Manual does not reproduce the requirements of the standard but rather paraphrases and elaborates upon them. Intended to be used in conjunction with the standard, this manual provides:

- Information on the intent and application of Standard 62.2
- Sample calculations and examples
- Best practices for avoiding foul odors and irritating contaminants
- Guidance for whole-building and local exhaust ventilation
- Valuable information on air-moving equipment
- Specific examples and background material
- Useful reference material

This manual is intended for residential HVAC contractors and installers, as well as residential builders, developers, and architects. It may also be useful to code officials and even discerning and technically savvy homeowners, real estate agents, and home appraisal professionals. This manual is written in clear, direct language, making it understandable to professionals and laymen alike. Standard 62.2 User's Manual is an essential supplement for professionals concerned with ventilation and indoor air quality in residences. Use it alongside your copy of ANSI/ASHRAE Standard 62.2-2016. In addition to offering immediate access to the content, the PDF download of this standard presents selected graphics in color for enhanced readability.

Climate Change, the Indoor Environment, and Health

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"Provides foundational guidance for improving energy performance (of envelope, space-conditioning, ventilation, water-heating, lighting, and plug-load systems) and indoor environmental quality and promotes best practices for designing, operating, and owning dwelling units and common spaces in low- to mid-rise multifamily residential buildings, including high-performance and zero energy buildings"--

Dampers and Airflow Control

Evidence has accumulated that shows that the quality of indoor environments can affect the health and productivity of adults and children. One consequence is that a movement has emerged to promote the design of schools that have fewer adverse environmental effects. To examine the potential of such design for improving education, several private organizations asked the NRC to review and assess the health and productivity benefits of green schools. This report provides an analysis of the complexity of making such a determination; and an assessment of the potential human health and performance benefits of improvements in the building envelope, indoor air quality, lighting, and acoustical quality. The report also presents an assessment of the overall building condition and student achievement, and offers an analysis of and recommendations for planning and maintaining green schools including research considerations.

HVAC Duct Construction Standards - Metal and Flexible 3rd Ed

"Reference manual for planning, design, and operation of laboratory HVAC systems to reduce the laboratory's energy footprint while ensuring safety, providing good comfort and indoor air quality, and protecting the integrity of experiments; includes online access to electronic design tools that illustrate features of laboratories and provide practical design aids"--

ASHRAE Design Guide for Low- to Mid-rise Multifamily Residential Buildings

The Guide to Meeting the Challenges of Tall Buildings Tall buildings present unique and formidable challenges to architects and engineers because of their size, location in major urban areas, and the multiple, complex occupancies they often contain. ASHRAE Design Guide for Tall, Supertall, and Megatall Building Systems is a unique reference for owners; architects; and mechanical, structural, and electrical engineers as well as other specialized consultants involved in designing systems for these buildings. Expanded since ASHRAE's previous guide on the topic in 2004, this new design guide covers not only tall buildings (taller than 300 ft [91m]) but now also addresses supertall (taller than 984 ft [300 m]) and megatall (taller than 1968 ft [600 m]) buildings, with a broadened scope and updated

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content that reflects current standards and industry practices. This guide not only focuses on the efforts of designers of the HVAC systems but also addresses the importance of the design team and their collective efforts and concerns that are the critical elements in determining the ultimate solutions to the project needs of a tall building. This guide addresses design issues for tall commercial buildings, which are very often mixed use, with low-level retail, office floors, residential floors, and hotel floors. Major sections cover the following subjects: Architectural design, Façade systems, Climate data, Indoor air quality (IAQ) and thermal comfort, HVAC systems, Electrical system interfaces, Intelligent buildings and controls, Water distribution, Plumbing systems, Energy modeling and authentication, Vertical transportation, Life safety, Needs of residential occupancies. Also included are appendices with examples of stack effect and wind pressure for four representative climates, energy analysis examples, and HVAC design criteria and a systems description for a multiple-tenant office building.

ASHRAE Design Guide for Tall, Supertall, and Megatall Building Systems

Finding solutions to indoor air quality problems is often a complex, multifaceted endeavor. This practical desk reference serve as a guide and information resource – both on treating existing indoor air problems effectively – and on preventing

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costly IAQ problems from occurring in the first place. A single discipline approach unfortunately tends to narrow both the control and the treatments options. This book cuts across professions to offer those concerned with the total facility a broader, more comprehensive approach to managing indoor air quality and mitigating indoor air quality problems. The fifth edition is extensively updated and edited in response to the rapid pace of changes and advances in the IAQ industry.

Residential Indoor Air Quality Guide

Good airflow control results when solid mechanical design is combined with excellent control strategy. Modern building requirements for the coordination of air ventilation, pressurization, temperature control, fire and smoke control, and energy reduction require integration at every level of design and operation. Dampers and Airflow Control is the first book of its kind. It bridges the gap between mechanical design and final damper control. This book covers not only theoretical aspects of application design but also practical aspects of existing applications, and the material applies to both new and retrofit projects. Among the topics discussed are new ASHRAE damper testing data, realistic but simplified pressure drop calculations, damper installations, and methods for economizers and minimum outdoor-air control. Tactics to linearize system airflow using damper response curves are also discussed, and new methods "not found in existing literature" are presented to characterize damper response to fit a process. Additional topics

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include torque, linkages, structural support, actuation, and engineered damper assemblies. Dampers and Airflow Control is written for building systems designers and contractors and provides sound examples and best practices to achieve good airflow control.

Air Distribution in Buildings

"Discusses cleanroom classification; standards; airflow patterns; pressure differentials; control of airborne and surface particulate, airborne molecular, liquid-borne, and microbial contaminants; testing and certification, qualification, and commissioning; electrical, control, and lighting systems; and utility services and provides specifics for cleanrooms in semiconductor, pharmaceutical, biotechnology and health care, and food processing facilities"--

ASHRAE Laboratory Design Guide

A comprehensive resource that builds a bridge between engineering disciplines and the building sciences and trades, Forensic Engineering: Damage Assessments for Residential and Commercial Structures provides an extensive look into the world of forensic engineering. With a focus on investigations associated with insurance industry claims, the book describes methodologies for performing

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insurance-related investigations including the causation and origin of damage to residential and commercial structures and/or unhealthy interior environments and adverse effects on the occupants of these structures. Edited by an industry expert with more than 30 years of experience, and authors with more than 100 years of experience in the field, the book takes the technical aspects of engineering and scientific principles and applies them to real-world issues in a non-technical manner. It provides readers with the experiences, investigation methodologies, and investigation protocols used in, and derived from completing thousands of forensic engineering investigations. It begins with providing a baseline methodology for completing forensic investigations and closes with advice on testifying as an expert witness. Much of what must be known in this field is not learned in school, but is based upon experience since recognizing the cause of a building system failure requires a blending of skills from the white collar and blue collar worlds. Such knowledge can be vital since failures (e.g., water entry) often result from construction activities completed out of sequence.. This book details proven methodologies based on over 7,000 field investigations, methodologies which can be followed by both professionals and laymen alike.

Performance Measurement Protocols for Commercial Buildings

The ASHRAE Laboratory Design Guide has been organized and developed to provide owners, designers, contractors, and operators with key information on the

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essential requirements for achieving high quality laboratory facilities. This design guide can be used for the design, troubleshooting, and operation of laboratory facilities or can be used as a comprehensive reference.

Mechanical and Electrical Equipment for Buildings

This comprehensive volume, often called the “HVAC bible,” has been thoroughly updated to cover the latest code changes, equipment, and techniques HVAC Equations, Data, and Rules of Thumb, 3e offers all of the information an HVAC student or professional needs in one resource. The book thoroughly explains the expansion of piping systems and temperature limitations of new materials such as polyethylene, polypropylene, PVC, CPVC, and PEX. Detailed information is included for all types of facilities, including offices, hotels, hospitals, restaurants, commercial spaces, and computer rooms. This practical handbook reflects all the latest code changes—including the ASHRAE standards—and explains how to interpret and put them to use. It includes completely updated coverage of new pumps, chillers, air handling units, cooling equipment, boilers, and pipe material. You will get complete coverage of sustainability organizations that have become more important since last edition, including LEED, USGBC, Energy Star. Features hundreds of equations and rules for everything from ductwork to air-handling systems Includes a brand-new chapter on sound, vibration, and acoustics Contains an updated list of equipment manufacturers for all products featured

Damp Buildings, Human Health, and HVAC Design

The 2013 ASHRAE Handbook--Fundamentals covers basic principles and data used in the HVAC and R industry. Updated with research sponsored by ASHRAE and others, this volume includes 1,000 pages and 39 chapters covering general engineering information, basic materials, climate data, load and energy calculations, duct and pipe design, and sustainability, plus reference tables for abbreviations and symbols, I-P to SI conversions, and physical properties of materials.

Indoor Pollutants

Mold, radon, and poor indoor air quality have made it into the news and into home insurance policies and builders' liability insurance

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