

# Ashrae Underfloor Air Distribution Design Guide

Underfloor Air Distribution (UFAD) Design Guide Underfloor Air Distribution: A Comprehensive Guide to Modern HVAC Systems UFAD Guide Alternative Air Conditioning Technologies Underfloor Air Distribution (UFAD) □□□□□ Using ductwork to improve supply plenum temperature distribution in underfloor air distribution (UFAD) system Room Air Stratification Model for Underfloor Air Distribution System Performance of Underfloor Air Distribution in a Fieldsetting A Study of the Thermal Comfort and Ventilation Performance of an Underfloor Air Distribution System Alternative Air Conditioning Technologies Creating a Personal Environment Using Underfloor Air Distribution and Task/ambient Conditioning Systems Energy Performance of Underfloor Air Distribution Systems Performance Assessment of Commercial Underfloor Air Distribution Buildings Performance and Optimization of an Underfloor Air Distribution System in an Educational Building in a Hot and Humid Climate UFAD O & M Guide Sustainaspeak Sustainable Buildings and Infrastructure Building Systems for Interior Designers Underfloor Plenum Air Distribution Fred S. Bauman Charles Nehme Ashrae Liangcai Tan Wilmer Pasut Qiang Zhang Jae D. Chang Tom Webster Jarrod N. Reimer Yoon Soo Lee Vasiliy Khmelenko ASHRAE. Elizabeth Lewis Annie R. Pearce Corky Binggeli Jerome T. Miller Underfloor Air Distribution (UFAD) Design Guide Underfloor Air Distribution: A Comprehensive Guide to Modern HVAC Systems UFAD Guide Alternative Air Conditioning Technologies Underfloor Air Distribution (UFAD) □□□□□ Using ductwork to improve supply plenum temperature distribution in underfloor air distribution (UFAD) system Room Air Stratification Model for Underfloor Air Distribution System Performance of Underfloor Air Distribution in a Fieldsetting A Study of the Thermal Comfort and Ventilation Performance of an Underfloor Air Distribution System Alternative Air Conditioning Technologies Creating a Personal Environment Using Underfloor Air Distribution and Task/ambient Conditioning Systems Energy Performance of Underfloor Air

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this guide is ideal for hvac design engineers architects building owners facility managers equipment manufacturers and installers utility engineers researchers and other users of underfloor air distribution ufad technology ufad systems are innovative methods for delivering space conditioning in offices and other commercial buildings improved thermal comfort improved ventilation efficiency and indoor air quality reduced energy use and reduced life cycle building costs the guide explains these as some of the advantages that ufad systems have over traditional overhead air distribution systems this guide provides assistance in the design of ufad systems that are energy efficient intelligently operated and effective in their performance it also describes important research results that support current thinking on ufad design and includes an extensive annotated bibliography for those seeking additional detailed information

the growing demand for energy efficient sustainable and flexible building systems has reshaped how we design and operate modern workspaces as a crucial component of contemporary hvac systems underfloor air distribution ufad technology offers an innovative approach to air delivery that can significantly enhance both occupant comfort and energy efficiency this book aims to provide a comprehensive guide for engineers architects facility managers and professionals involved in the design installation and operation of ufad systems over the past few decades the evolution of building technologies has prompted a shift away from traditional overhead air distribution systems ufad systems with their ability to deliver conditioned air directly from the floor are proving to be particularly effective in open plan offices data centers and spaces requiring adaptive layouts however as with any system the success of a ufad system hinges on a thorough understanding of its design principles proper installation and

ongoing maintenance this book was born out of the need for a clear structured resource that can guide professionals through the complexities of ufa from the fundamental science behind air distribution to the nuances of real world system implementation each chapter builds upon the last starting with an introduction to ufa and gradually delving into more detailed aspects like airflow dynamics commissioning and sustainability while ufa offers numerous benefits such as increased energy efficiency improved thermal comfort and design flexibility these advantages are realized only when the system is designed and maintained with precision throughout this book we will explore not only the technical aspects of ufa systems but also practical insights and lessons learned from successful projects i hope that this book serves as a valuable resource for professionals at all levels whether you are considering ufa for a new construction project or seeking ways to optimize an existing system by understanding both the opportunities and challenges that ufa presents you can leverage this technology to create more comfortable energy efficient and adaptable environments thank you for embarking on this journey into the world of ufa i am confident that together we can push the boundaries of what is possible in building design and air distribution

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this project covered the laboratory investigation phase of task 2 where the performance and cost effectiveness of underfloor air distribution and conventional air distribution systems were compared

underfloor air distribution ufa is a new method of supplying heated or cooled air throughout a building reported advantages of ufa include energy savings and improved indoor air quality iaq we measured several aspects of the performance of an ufa system installed in a medium size office building the measured air change effectiveness was very close to unity which is comparable to that measured in buildings with typical overhead air distribution the pollutant removal efficiency for carbon dioxide was 13 higher than expected in a space with well mixed air suggesting a 13 reduction in exposures to occupant generated pollutants the increase in indoor air temperatures with height above the floor was only 1 to 2 c this amount of

thermal stratification could reduce the sensible energy requirements for cooling of outdoor air by approximately 10 the occupant's level of satisfaction with thermal conditions was well above average and this high satisfaction rating could possibly be due in all or part to the use of a ufad system the results of this study provide some evidence of moderate energy and iaq related benefits of ufad before general conclusions are drawn the benefits need to be confirmed in other studies

recent trends in today's office environment make it increasingly more difficult for conventional centralized hvac systems to satisfy the environmental preferences of individual office workers using the standardized approach of providing a single uniform thermal and ventilation environment since its original introduction in west germany during the 1950s the open plan office containing modular workstation furniture and partitions is now the norm thermostatically controlled zones in open plan offices typically encompass relatively large numbers of workstations in which a diverse work population having a wide range of preferred temperatures must be accommodated modern office buildings are also being impacted by a large influx of heat generating equipment computers printers etc whose loads may vary considerably from workstation to workstation offices are often reconfigured during the building's lifetime to respond to changing tenant needs affecting the distribution of within space loads and the ventilation pathways among and over office partitions compounding this problem there has been a growing awareness of the importance of the comfort health and productivity of individual office workers giving rise to an increased demand among employers and employees for a high quality work environment during recent years an increasing amount of attention has been paid to air distribution systems that individually condition the immediate environments of office workers within their workstations to address the issues outlined above as with task ambient lighting systems the controls for the task components of these systems are partially or entirely decentralized and under the control of the occupants typically the occupant has control over the speed and direction and in some cases the temperature of the incoming air supply variously called task ambient conditioning localized thermal distribution and personalized air conditioning systems these systems have been most commonly installed in open plan office buildings in which they provide supply air and in some cases radiant heating directly into workstations tac systems can be classified into the following two major categories 1 furniture based and 2 floor

based underfloor air distribution (UFAD) a large majority of these systems include a raised floor system with which underfloor plenums are used to deliver conditioned air to the space through floor grills or in conjunction with the workstation furniture and partitions

Today there is a proliferation of different HVAC system configurations. Design and performance of each HVAC system are dependent on climate and the intended use of the building. Energy recovery ventilation is becoming more common in new buildings and is one of the more popular retrofit options in hot and humid climates. Currently there is a lack of optimization strategies that involve the underfloor air systems combined with energy recovery ventilation (ERV) especially in hot and humid climate. This thesis examines the performance and optimization of underfloor air distribution systems (UFAD) in hot and humid climates. This thesis also compares the UFAD system performance to a typical overhead air handler unit (AHU) system found in Texas. The performance comparison is done with EnergyPlus modeling software. Separate sets of models are created to examine performance at different operational parameters. The minimum air flow rates are modeled at 0.1 cfm/ft<sup>2</sup>, 0.2 cfm/ft<sup>2</sup>, 0.3 cfm/ft<sup>2</sup>, 0.4 cfm/ft<sup>2</sup> for both UFAD and overhead (OH) systems. The supply air temperatures were modeled at 55°F, 60°F, and 63°F. Outside air strategies include simple economizer, energy recovery ventilation (ERV) as well as a combination of both economizer and ERV. The study found that at low minimum 0.1 cfm/ft<sup>2</sup> flow rates an overhead system will slightly outperform a UFAD system. OH is 2.6% cheaper to operate than UFAD while at 0.3 cfm/ft<sup>2</sup> a UFAD system is more efficient. UFAD is 14.8% cheaper to operate. The outside air strategies have the same energy savings effect on both systems. The UFAD system has a higher peak cooling load and a lower peak heating load compared to the overhead system. This thesis also covers the stratification and supply air temperature measurements within two offices inside the Mitchell Physics Building located on the Texas A&M campus. The stratification measurements showed that on average the stratification was lower than expected for such systems. With office 411 having average stratification of 1.8°F and office 423 average stratification of 1.5°F. Temperature measurements at the diffuser level showed some reheat especially during unoccupied periods such as early mornings, late evenings, and weekends. Even when the outside temperature was above the interior thermostat set point, system level total supply air flow rate showed little variation.

with a minimum of 0.47 cfm/ft<sup>2</sup> and a maximum of 0.59 cfm/ft<sup>2</sup> the analysis of energy recovery wheel operation concluded that the low exhaust air flow of only 0.2 of the outside air is responsible for the low temperature difference observed in the outside air stream through the ERV. The electronic version of this dissertation is accessible from HDL handle net 1969.1.155245

A comprehensive guide on the operations and maintenance of underfloor air distribution systems offers practical advice for the builder, technician, and building owner or their representative.

Architecture 2030, bug, biophilic design, BIPV, circular economy, LEED, passive design, solar chimney systems, thinking well, xeriscaping. What does it all mean? The complex and evolving language used in the sustainable design community can be very challenging, particularly to those new to environmentally friendly and resource-efficient design strategies that are needed today. Definitions of over two hundred terms, with further sources clearly cross-referenced, with *Sustainaspeak*, *Theoryspeak*, and *Archispeak* terms illustrated throughout with sustainable award-winning buildings by e.g. Behnisch, Brooks, Scarpa, EHDD, Kierantimberlake, Lake Flato, Leddy Mahtum, Stacy Smithgroup, Perkins+Will, ZGF, VMDO, and McDonough Partners. *Sustainaspeak: A Guide to Sustainable Design Terms* provides a current guide to the sustainable design strategies, terms, and practices needed for the next generation of designers, architects, students, and community leaders to design a carbon-neutral world for future generations.

The second edition of *Sustainable Buildings and Infrastructure* continues to provide students with an introduction to the principles and practices of sustainability as they apply to the construction sector, including both buildings and infrastructure systems. As a textbook, it is aimed at students taking courses in construction management and the built environment, but it is also designed to be a useful reference for practitioners involved in implementing sustainability in their projects or firms. Case studies, best practices, and highlights of cutting-edge research are included throughout, making the book both a core reference and a practical guide.

Building systems for interior designers make design decisions informed by technical and structural knowledge. With this essential

guide professional interior design demands more than simply an understanding of aesthetic and artistic considerations it also requires a detailed understanding of building systems and their interactions design decisions must account for mechanical and electrical equipment building components and structural elements all of which can potentially shape a designer s work building systems for interior designers has long stood as the key to understanding and evaluating these elements particularly key building systems like hvac and plumbing and their impacts on interior design this fourth edition is fully updated to fit the needs of the cida certified interior design program and the ncidq exam the fourth edition of building systems for interior designers also includes updated information on sustainable and energy efficient design detailed coverage of topics including security concerns fire safety and designing secure spaces classroom supplements including sample construction documents chapter specific discussion questions and more building systems for interior designers is ideal for students in interior design courses and new professionals studying for ncidq exams

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