

Cooling Load Calculation And Design Of Air Conditioning

Heating and Cooling of Buildings: Principles and Practice of Energy Efficient Design, Third Edition is structured to provide a rigorous and comprehensive technical foundation and coverage to all the various elements inherent in the design of energy efficient and green buildings. Along with numerous new and revised examples, design case studies, and homework problems, the third edition includes the HCB software along with its extensive website material, which contains a wealth of data to support design analysis and planning. Based around current codes and standards, the Third Edition explores the latest technologies that are central to design and operation of today's buildings. It serves as an up-to-date technical resource for future designers, practitioners, and researchers wishing to acquire a firm scientific foundation for improving the design and performance of buildings and the

Online Library Cooling Load Calculation And Design Of Air Conditioning

comfort of their occupants. For engineering and architecture students in undergraduate/graduate classes, this comprehensive textbook:

In recent years, the sustainability and safety of perishable foods has become a major consumer concern, and refrigeration systems play an important role in the processing, distribution, and storage of such foods. To improve the efficiency of food preservation technologies, it is necessary to explore new technological and scientific advances both in materials and processes. The Handbook of Research on Advances and Applications in Refrigeration Systems and Technologies gathers state-of-the-art research related to thermal performance and energy-efficiency. Covering a diverse array of subjects—from the challenges of surface-area frost-formation on evaporators to the carbon footprint of refrigerant chemicals—this publication provides a broad insight into the optimization of cold-supply chains and serves as an essential reference text for undergraduate students, practicing engineers, researchers, educators, and

Online Library Cooling Load Calculation And Design Of Air Conditioning

policymakers.

Conventional thermal power generating plants reject a large amount of energy every year. If this rejected heat were to be used through district heating networks, given prior energy valorisation, there would be a noticeable decrease in the amount of fossil fuels imported for heating. As a consequence, benefits would be experienced in the form of an increase in energy efficiency, an improvement in energy security, and a minimisation of emitted greenhouse gases. Given that heat demand is not expected to decrease significantly in the medium term, district heating networks show the greatest potential for the development of cogeneration. Due to their cost competitiveness, flexibility in terms of the ability to use renewable energy resources (such as geothermal or solar thermal) and fossil fuels (more specifically the residual heat from combustion), and the fact that, in some cases, losses to a country/region's energy balance can be easily integrated into district heating networks (which would not be the case in a "fully

Online Library Cooling Load Calculation And Design Of Air Conditioning

electric" future), district heating (and cooling) networks and cogeneration could become a key element for a future with greater energy security, while being more sustainable, if appropriate measures were implemented. This book therefore seeks to propose an energy strategy for a number of cities/regions/countries by proposing appropriate measures supported by detailed case studies.

Volume 1: Indoor and Outdoor Environment

Energy Dynamics of Green Buildings
Third Edition, Version 2. 50
Cooling and Heating Load Calculation Manual

BIM in Small-Scale Sustainable Design

This text provides a guide to the specification and application of all types of commercial and residential air conditioning equipment. It guides the reader through each step of the process of proper system design, including equipment selection, sizing, placement and installation.

The complete guide to building technology This comprehensive guide provides complete coverage of every aspect of the building technologist's profession. It details design and installation procedures,

Online Library Cooling Load Calculation And Design Of Air Conditioning

describes all relevant equipment and hardware, and illustrates the preparation of working drawings and construction details that meet project specifications, code requirements, and industry standards. The author establishes procedures for professional field inspections and equipment operations tests, provides real-world examples from both residential and nonresidential construction projects, and makes specific references to code compliance throughout the text. This new edition incorporates changes in building codes, advances in materials and design techniques, and the emergence of computer-aided design (CAD), while retaining the logical structure and helpful special features of the first edition. More than 1,100 drawings, tables, and photographs complement and illustrate discussions in the text.

*Topics covered include: * Heating, ventilating, and air conditioning systems- equipment and design **

*Plumbing systems- equipment and design * Electrical and lighting systems- equipment and design **

*Testing, adjusting, and balancing procedures for all building systems * Every aspect of the building technologist's profession, from the creation of working drawings through on-site supervision and systems maintenance Extensive appendices include conversion factors; duct design data; test report forms for use in field work; design forms and schedules for electrical, HVAC, and plumbing work; and more.*

Online Library Cooling Load Calculation And Design Of Air Conditioning

Proceedings of the 8th International Symposium on Heating, Ventilation and Air Conditioning is based on the 8th International Symposium of the same name (ISHVAC2013), which took place in Xi'an on October 19-21, 2013. The conference series was initiated at Tsinghua University in 1991 and has since become the premier international HVAC conference initiated in China, playing a significant part in the development of HVAC and indoor environmental research and industry around the world. This international conference provided an exclusive opportunity for policy-makers, designers, researchers, engineers and managers to share their experience. Considering the recent attention on building energy consumption and indoor environments, ISHVAC2013 provided a global platform for discussing recent research on and developments in different aspects of HVAC systems and components, with a focus on building energy consumption, energy efficiency and indoor environments. These categories span a broad range of topics, and the proceedings provide readers with a good general overview of recent advances in different aspects of HVAC systems and related research. As such, they offer a unique resource for further research and a valuable source of information for those interested in the subject. The proceedings are intended for researchers, engineers and graduate students in the fields of Heating, Ventilation and Air Conditioning (HVAC), indoor environments, energy

Online Library Cooling Load Calculation And Design Of Air Conditioning

systems, and building information and management. Angui Li works at Xi'an University of Architecture and Technology, Yingxin Zhu works at Tsinghua University and Yuguo Li works at The University of Hong Kong.

State of the Art of Computer Aided Environmental Design

Handbook of Research on Advances and Applications in Refrigeration Systems and Technologies

REFRIGERATION AND AIR CONDITIONING Building Technology

Design and Control of Hydronic Radiant Cooling Systems

Proceedings of the 8th International Symposium on Heating, Ventilation and Air Conditioning

"This manual focuses on the calculation of cooling and heating loads for commercial buildings. The heat balance method (HBM) and radiant time series method (RTSM) (as well as how to implement these methods) are discussed. Heat transfer processes and their analysis, psychrometrics, and heating load calculations are also considered"--

"While most books related to BIM are focused on large-scale architectural projects, this is the only book focused on BIM strategies for modest-scaled architectural projects that are sustainably designed. Specific in its examples and methods, the book serves as practical guide for architects and is

Online Library Cooling Load Calculation And Design Of Air Conditioning

intended to be a desktop companion. Other books, other than software guides, tend to treat BIM or sustainable practices separately in a high-level discussion"--

Heating Ventilation and Air Conditioning by J. W. Mitchell and J. E. Braun provides foundational knowledge for the behavior and analysis of HVAC systems and related devices. The emphasis of this text is on the application of engineering principles that features tight integration of physical descriptions with a software program that allows performance to be directly calculated, with results that provide insight into actual behavior. Furthermore, the text offers more examples, end-of-chapter problems, and design projects that represent situations an engineer might face in practice and are selected to illustrate the complex and integrated nature of an HVAC system or piece of equipment.

Fundamentals of Air Conditioning Systems
Design for Efficiency, Revised Second Edition
Heating and Cooling of Buildings
Air-conditioning System Design Manual
Concepts, Methodologies, Tools, and
Applications
Earth-sheltered Buildings

Issues in Energy Research and Application / 2012 Edition is a ScholarlyBrief™ that delivers timely, authoritative, comprehensive, and specialized information about Energy Research in a concise format. The editors have built Issues in Energy Research and Application: 2012 Edition on the

Online Library Cooling Load Calculation And Design Of Air Conditioning

vast information databases of ScholarlyNews.™ You can expect the information about Energy Research in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Energy Research and Application: 2012 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at <http://www.ScholarlyEditions.com/>.

This book covers all important, new, and conventional aspects of building electrical systems, power distribution, lighting, transformers and rotating electric machines, wiring, and building installations. Solved examples, end-of-chapter questions and problems, case studies, and design considerations are included in each chapter, highlighting the concepts, and diverse and critical features of building and industrial electrical systems, such as electric or thermal load calculations; wiring and wiring devices; conduits and raceways; lighting analysis, calculation, selection, and design; lighting equipment and luminaires; power quality; building monitoring; noise control; building energy envelope; air-conditioning and ventilation; and safety. Two chapters are dedicated to distributed energy generation, building integrated renewable energy systems, microgrids, DC nanogrids, power electronics, energy management, and

Online Library Cooling Load Calculation And Design Of Air Conditioning

energy audit methods, topics which are not often included in building energy textbooks. Support materials are included for interested instructors. Readers are encouraged to write their own solutions while solving the problems, and then refer to the solved examples for more complete understanding of the solutions, concepts, and theory.

*The Air Conditioning Manual assists entry-level engineers in the design of air-conditioning systems. It is also usable - in conjunction with fundamental HVAC&R resource material - as a senior- or graduate-level text for a university course in HVAC system design. The manual was written to fill the void between theory and practice - to bridge the gap between real-world design practices and the theoretical calculations and analytical procedures or on the design of components. This second edition represents an update and revision of the manual. It now features the use of SI units throughout, updated references and the editing of many illustrations. * Helps engineers quickly come up with a design solution to a required air conditioning system. * Includes issues from comfort to cooling load calculations. * New sections on "Green HVAC" systems deal with hot topic of sustainable buildings.*

Computational Intelligence, Networked Systems and Their Applications

*Consumer Durable Choice and the Demand for Electricity
District Heating and Cooling Networks*

Principles of Heating, Ventilation, and Air Conditioning in Buildings

An Integrated Approach to Sustainable Engineering

Online Library Cooling Load Calculation And Design Of Air Conditioning

Central Plant Air Conditioning

Manual J 8th Edition is the national ANSI-recognized standard for producing HVAC equipment sizing loads for single-family detached homes, small multi-unit structures, condominiums, town houses, and manufactured homes. This new version incorporates the complete Abridged Edition of Manual J. The manual provides quick supplemental details as well as supporting reference tables and appendices. A proper load calculation, performed in accordance with the Manual J 8th Edition procedure, is required by national building codes and most state and local jurisdictions. This textbook provides a concise, systematic treatment of essential theories and practical aspects of refrigeration and air-conditioning systems. It is designed for students pursuing courses in mechanical engineering both at diploma and degree level with a view to equipping them with a fundamental background necessary to understand the latest methodologies used for the design of refrigeration and air-conditioning systems. After reviewing the physical principles, the text focuses on the refrigeration cycles commonly used in air-conditioning applications in tropical climates. The subject of psychrometry for analysing the various thermodynamic processes in air conditioning is particularly dealt with in considerable detail. The practical design problems require comprehensive use of tables and charts prepared by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). This text incorporates such tables and charts so that the

Online Library Cooling Load Calculation And Design Of Air Conditioning

students are exposed to solving real-life design problems with the help of ASHRAE Tables. Finally, the book highlights the features, characteristics and selection criteria of hardware including the control equipment. It also provides the readers with the big picture in respect of the latest developments such as thermal storage air conditioning, desiccant cooling, chilled ceiling cooling, Indoor Air Quality (IAQ) and thermal comfort. Besides the students, the book would be immensely useful to practising engineers as a ready reference.

Heating and Cooling Load Calculations International Series of Monographs In: Heating, Ventilation and Refrigeration Elsevier

Architecture

Design Cooling Load Calculation and Equipment Selection Guidance

Heating, Ventilating, and Air Conditioning

Issues in Energy Research and Application: 2012 Edition

A Microcomputer Based Design Tool for Building Zone Cooling Load Calculation

8th Edition, Full

The Third Edition of ANSI/ACCA Manual D is the Air Conditioning Contractors of America procedure for sizing residential duct systems. This procedure uses Manual J (ANSI/ACCA, Eighth Edition) heating and cooling loads to determine space air delivery

Online Library Cooling Load Calculation And Design Of Air Conditioning

requirements. This procedure matches duct system resistance (pressure drop) to blower performance (as defined by manufacture's blower performance tables). This assures that appropriate airflow is delivered to all rooms and spaces; and that system airflow is compatible with the operating range of primary equipment. The capabilities and sensitivities of this procedure are compatible with single-zone systems, and multi-zone (air zoned) systems. The primary equipment can have a multi-speed blower (PSC motor), or a variable-speed blower (ECM or constant torque motor), or a true variable speed motor). Edition Three, Version 2.50 of Manual D (D3) specifically identifies normative requirements, and specifically identifies related informative material.

As the human population expands and natural resources become depleted, it becomes necessary to explore other sources for energy consumption and usage. Renewable and Alternative Energy: Concepts, Methodologies, Tools, and Applications provides a comprehensive overview of emerging

Online Library Cooling Load Calculation And Design Of Air Conditioning

perspectives and innovations for alternative energy sources. Highlighting relevant concepts on energy efficiency, current technologies, and ongoing industry trends, this is an ideal reference source for academics, practitioners, professionals, and upper-level students interested in the latest research on renewable energy.

Heating and Cooling Load Calculations is a handbook that covers various concerns in calculating heating and cooling. The title provides a logical study of the physical and engineering factors that affect the heating and cooling load. The coverage of the text includes heat transfer; heating loads and its reduction; and design temperature conditions. The text also covers the cooling design conditions and the components of cooling load and its reduction. The book will be of great use to both student and professional engineers.

*NBSLD, the Computer Program for Heating and Cooling Loads in Buildings
Energy-oriented Computer Programs for the Design and Monitoring of Buildings*

Online Library Cooling Load Calculation And Design Of Air Conditioning

*Manual J - Residential Load Calculation
Residential Duct Systems - Manual D
Strategy Guideline
Load Calculation Applications Manual (I-P Edition)*

This book highlights the significance of using sustainable energy to prevent the deterioration of our planet using heat pumps. Energy sustainability can be achieved through improved energy efficiency. In this regard, heat pumps offer an energy-efficient alternative for heating and cooling. To drive the adoption of heat pumps as a key component of sustainable buildings, the authors focus on examining sustainable practices in heat pump operations and innovative system design. In view of the growing desire to use sustainable energy to meet heating and cooling demands and improve indoor air quality, this book offers a valuable reference guide to the available options in HVAC (heating, ventilation, and air-conditioning) system design. To begin with, the authors define sustainable energy and discuss the trend of “thinking green” in building design. They then discuss sustainable practices and heat pump applications in mapping out HVAC systems. In turn, they examine the use of green operations to promote sustainable practices

and, in order to highlight the importance of innovative design, discuss the configuration options and precision control aspects. In closing, the authors illustrate innovative sustainable design on the basis of several energy-efficient cases. The book's main goal is to drive the adoption of sustainable energy solutions. Heat pumps, it argues, represent the most efficient system for meeting commercial/recreational/residential heating and cooling demands. The book not only examines industrial practices in heat pump application, but also discusses advanced heat pump technologies and innovative heat pump designs.

The art and the science of building systems design evolve continuously as designers, practitioners, and researchers all endeavor to improve the performance of buildings and the comfort and productivity of their occupants. Retaining coverage from the original second edition while updating the information in electronic form, Heating and Cooling of Buildings: Design for Efficiency, Revised Second Edition presents the technical basis for designing the lighting and mechanical systems of buildings. Along with numerous homework problems, the revised second edition offers a full chapter on economic analysis and optimization, new heating and cooling load procedures and

databases, and simplified procedures for ground coupled heat transfer calculations. The accompanying CD-ROM contains an updated version of the Heating and Cooling of Buildings (HCB) software program as well as electronic appendices that include over 1,000 tables in HTML format that can be searched by major categories, a table list, or an index of topics. Ancillary information is available on the book's website www.hcbcentral.com From materials to computers, this edition explores the latest technologies exerting a profound effect on the design and operation of buildings. Emphasizing design optimization and critical thinking, the book continues to be the ultimate resource for understanding energy use in buildings. The heating, ventilation, and air conditioning (HVAC) system is arguably the most complex system installed in a house and is a substantial component of the total house energy use. A right-sized HVAC system will provide the desired occupant comfort and will run efficiently. This Strategy Guideline discusses the information needed to initially select the equipment for a properly designed HVAC system. Right-sizing of an HVAC system involves the selection of equipment and the design of the air distribution system to

meet the accurate predicted heating and cooling loads of the house. Right-sizing the HVAC system begins with an accurate understanding of the heating and cooling loads on a space; however, a full HVAC design involves more than just the load estimate calculation - the load calculation is the first step of the iterative HVAC design procedure. This guide describes the equipment selection of a split system air conditioner and furnace for an example house in Chicago, IL as well as a heat pump system for an example house in Orlando, Florida. The required heating and cooling load information for the two example houses was developed in the Department of Energy Building America Strategy Guideline: Accurate Heating and Cooling Load Calculations.

**International Series of Monographs In:
Heating, Ventilation and Refrigeration
Mechanical and Electrical Equipment for
Buildings
Load Calculation
Analysis and Design
Refrigeration Engineering
Strategy guideline**

*The definitive guide to the design of
environmental control systems for
buildings—now updated in its 13th Edition
Mechanical and Electrical Equipment for*

Online Library Cooling Load Calculation And Design Of Air Conditioning

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 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

Online Library Cooling Load Calculation And Design Of Air Conditioning

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."

This book constitutes the second part of the refereed proceedings of the International Conference on Life System Modeling and Simulation, LSMS 2014, and of the International Conference on Intelligent Computing for Sustainable Energy and Environment, ICSEE 2014, held in Shanghai, China, in September 2014. The 159 revised full papers presented in the three volumes of CCIS 461-463 were carefully reviewed and selected from 572 submissions. The papers of this volume are organized in topical sections on advanced neural network theory and algorithms; advanced evolutionary computing theory and algorithms, such as particle swarm optimization, differential evolution, ant colonies, artificial life, artificial immune systems and genetic algorithm; fuzzy, neural, and fuzzy-neuro hybrids; intelligent modeling, monitoring, and control of complex nonlinear systems; intelligent modeling and

Online Library Cooling Load Calculation And Design Of Air Conditioning

simulation of climate change; communication and control for distributed networked systems.

Based on the most recent standards from ASHRAE, the sixth edition provides complete and up-to-date coverage of all aspects of heating, ventilation, and air conditioning. The latest load calculation procedures, indoor air quality procedures, and issues related to ozone depletion are covered. New to this edition is the inclusion of additional realistic, interactive and in-depth examples available on the book website (www.wiley.com/college/mcquiston) that enable students to simulate various scenarios to apply concepts from the text. Also integrated throughout the text are numerous worked examples that clearly show students how to apply the concepts in realistic scenarios. The sixth edition has also been revised to be more accessible to students for easier comprehension. Suitable for one or two semester, Junior/Senior/Graduate course in HVAC taught in Mechanical Engineering, Architectural Engineering, and Mechanical Engineering Technology departments. Renewable and Alternative Energy: Concepts, Methodologies, Tools, and Applications accurate heating and cooling load calculations

Whole System Design

International Conference on Life System Modeling and Simulation, LSMS 2014 and International Conference on Intelligent

Online Library Cooling Load Calculation And Design Of Air Conditioning

Computing for Sustainable Energy and Environment, ICSEE 2014, Shanghai, China, September 2014, Proceedings, Part II Heat Pumps for Sustainable Heating and Cooling

Heating and Cooling Load Calculations

This guide presents the key criteria required to create accurate heating and cooling load calculations and offers examples of the implications when inaccurate adjustments are applied to the HVAC design process. The guide shows, through realistic examples, how various defaults and arbitrary safety factors can lead to significant increases in the load estimate. Emphasis is placed on the risks incurred from inaccurate adjustments or ignoring critical inputs of the load calculation.

This book develops the theory of durable choice and utilization.

The basic assumption is that the demand for energy is a derived demand arising through the production of household services.

Durable choice is associated with the choice of a particular technology for providing the household service. Econometric systems are derived which capture both the discrete choice nature of appliance selection and the determination of continuous conditional demand. Using the National Interim Energy Consumption Survey (NIECS) from 1978, a nested logit model of room air-conditioning, central air-conditioning, space-heating and water heating is estimated. The estimated probability choice model is used to forecast the impacts of proposed building standards for newly constructed single family detached residences. A network thermal model provides unit energy consumptions for alternative heating and cooling systems across time. Monthly billing data matched to NIECS is analyzed permitting seasonal estimation of the demand for electricity and

Online Library Cooling Load Calculation And Design Of Air Conditioning

natural gas by households. The theory of price specification for demand subject to a declining rate structure is reviewed and tested. Finally, consistent estimation procedures are used in the presence of possible correlation between dummy variables indicating appliance ownership and the equation error. The hypothesis of simultaneity in the demand system is tested.

Conditional moments in the generalized extreme value family are derived to extend discrete continuous econometric systems in which discrete choice is assumed logistic. An efficiency comparison of various two-stage consistent estimation techniques applied to a single equation of a dummy endogenous simultaneous equation system is undertaken and asymptotic distributions are derived for each estimation method.

Whole System Design is increasingly being seen as one of the most cost-effective ways to both increase the productivity and reduce the negative environmental impacts of an engineered system. A focus on design is critical as the output from this stage of the project locks in most of the economic and environmental performance of the designed system throughout its life which can span from a few years to many decades. Indeed it is now widely acknowledged that all designers - particularly engineers architects and industrial designers - need to be able to understand and implement a whole system design approach. This book provides a clear design methodology based on leading efforts in the field and is supported by worked examples that demonstrate how advances in energy materials and water productivity can be achieved through applying an integrated approach to sustainable engineering. Chapters 1-5 outline the approach and explain how it can be implemented to enhance the established Systems Engineering framework. Chapters 6-10 demonstrate through detailed worked examples the application of the approach to

Online Library Cooling Load Calculation And Design Of Air Conditioning

industrial pumping systems passenger vehicles electronics and computer systems temperature control of buildings and domestic water systems. Published with The Natural Edge Project the World Federation of Engineering Organizations UNESCO and the Australian Government.

Design of an Experimental Facility for the Validation of Cooling Load Calculation Procedures

ScholarlyBrief

Building Electrical Systems and Distribution Networks

Mechanical and Electrical Systems

HVAC Equipment Sizing

Accurate Heating and Cooling Load Calculations

English abstracts from Kholodil'naia tekhnika.

Improving energy efficiency in the Heating Ventilation and Air conditioning (HVAC) systems in buildings is critical to achieve the energy reduction in the building sector, which consumes 41% of all primary energy produced in the United States, and was responsible for nearly half of U.S. CO₂ emissions. Based on a report by the New Building Institute (NBI), when HVAC systems are used, about half of the zero net energy (ZNE) buildings report using a radiant cooling/heating system, often in conjunction with ground source heat pumps.

Radiant systems differ from air systems in the main heat transfer mechanism used to remove heat from a space, and in their control characteristics when responding to changes in control signals and room thermal conditions.

This dissertation investigates three related design and control topics: cooling load calculations, cooling capacity estimation, and control for the heavyweight radiant

Online Library Cooling Load Calculation And Design Of Air Conditioning

systems. These three issues are fundamental to the development of accurate design/modeling tools, relevant performance testing methods, and ultimately the realization of the potential energy benefits of radiant systems. Cooling load calculations are a crucial step in designing any HVAC system. In the current standards, cooling load is defined and calculated independent of HVAC system type. In this dissertation, I present research evidence that sensible zone cooling loads for radiant systems are different from cooling loads for traditional air systems. Energy simulations, in EnergyPlus, and laboratory experiments were conducted to investigate the heat transfer dynamics in spaces conditioned by radiant and air systems. The results show that the magnitude of the cooling load difference between the two systems ranges from 7-85%, and radiant systems remove heat faster than air systems. For the experimental tested conditions, 75-82% of total heat gain was removed by radiant system during the period when the heater (simulating the heat gain) was on, while for air system, 61-63% were removed. From a heat transfer perspective, the differences are mainly because the chilled surfaces directly remove part of the radiant heat gains from a zone, thereby bypassing the time-delay effect caused by the interaction of radiant heat gain with non-active thermal mass in air systems. The major conclusions based on these findings are: 1) there are important limitations in the definition of cooling load for a mixing air system described in Chapter 18 of ASHRAE Handbook of

Online Library Cooling Load Calculation And Design Of Air Conditioning

Fundamentals when applied to radiant systems; 2) due to the obvious mismatch between how radiant heat transfer is handled in traditional cooling load calculation methods compared to its central role in radiant cooling systems, this dissertation provides improvements for the current cooling load calculation method based on the Heat Balance procedure. The Radiant Time Series method is not appropriate for radiant system applications. The findings also directly apply to the selection of space heat transfer modeling algorithms that are part of all energy modeling software. Cooling capacity estimation is another critical step in a design project. The above mentioned findings and a review of the existing methods indicates that current radiant system cooling capacity estimation methods fail to take into account incident shortwave radiation generated by solar and lighting in the calculation process. This causes a significant underestimation (up to 150% for some instances) of floor cooling capacity when solar load is dominant. Building performance simulations were conducted to verify this hypothesis and quantify the impacts of solar for different design scenarios. A new simplified method was proposed to improve the predictability of the method described in ISO 11855 when solar radiation is present. The dissertation also compares the energy and comfort benefits of the model-based predictive control (MPC) method with a fine-tuned heuristic control method when applied to a heavyweight embedded surface system. A first order dynamic model of a radiant slab system was developed for implementation

Online Library Cooling Load Calculation And Design Of Air Conditioning

in model predictive controllers. A calibrated EnergyPlus model of a typical office building in California was used as a testbed for the comparison. The results indicated that MPC is able to reduce the cooling tower energy consumption by 55% and pumping power consumption by 26%, while maintaining equivalent or even better thermal comfort conditions. In summary, the dissertation work has: (1) provided clear evidence that the fundamental heat transfer mechanisms differ between radiant and air systems. These findings have important implications for the development of accurate and reliable design and energy simulation tools; (2) developed practical design methods and guidance to aid practicing engineers who are designing radiant systems; and (3) outlined future research and design tools need to advance the state-of-knowledge and design and operating guidelines for radiant systems. Heating and cooling load calculations are carried out to estimate the required capacity of heating and cooling systems, which can maintain the required conditions in the conditioned space. To estimate the required cooling or heating capacities, one has to have information regarding the design indoor and outdoor conditions, specifications of the building, specifications of the conditioned space (such as the occupancy, activity level, various appliances and equipment used etc.) and any special requirements of the particular application. For comfort applications, the required indoor conditions are fixed by the criterion of thermal comfort, while for industrial or commercial applications the required indoor conditions are fixed by

Online Library Cooling Load Calculation And Design Of Air Conditioning

the particular processes being performed or the products being stored. Generally, heating and cooling load calculations involve a systematic and stepwise procedure, which account for all the building energy flows. In practice, a variety of methods ranging from simple rules-of-thumb to complex transfer function methods are used to arrive at the building loads. This short quick book provides a procedure for preparing a manual calculation for cooling load using CLTD/CLF method suggested by ASHRAE and includes two detailed examples. For more advanced methods such as TFM, the reader should refer to ASHRAE and other handbooks. Learning Objective At the end of this course, the student should be able to: 1.

Understand the basic terminology and definitions related to air conditioning load calculations 2. Explain the differences between heating and cooling load design considerations 3. Explain the difference between 1) space heat gain v/s cooling load 2) space cooling v/s cooling load and 3) external loads v/s internal loads 4.

Differentiate between sensible and latent loads 5. List commonly used methods for estimating cooling loads 6. Estimate the internal and external cooling loads using CLTD/CLF method from building specifications, design indoor and outdoor conditions, occupancy etc. 7. Describe various equations and the information sources to determine conductive load through opaque building elements. 8. Describe various equations and information sources to determine the solar transmission load through glazing. 9. Describe various equations and information

Online Library Cooling Load Calculation And Design Of Air Conditioning

sources to determine the internal load due to people, lights and power appliances.10. Determine the supply air flow rate11. Learn by examples the detailed methodology to cooling load calculations12. Learn the functional parameters of software programs such as TRACE 700 and CHVAC

An Introduction

Principles and Practice of Energy Efficient Design, Third Edition

Hvac Cooling Load - Calculations & Principles