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Heating and Cooling of Buildings
Jan F. Kreider 2009-12-28 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 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 comfort of their occupants. For engineering and architecture students in undergraduate/graduate classes, this comprehensive textbook:

Heating, Cooling, Lighting
Norbert Lechner 1991-01-16 Using a qualitative rather than a quantitative approach, presents detailed information based on concepts, rules, guidelines, intuition, and experience for architects in the areas of heating, cooling, and lighting at the schematic design stage. The data explored supports a three-tiered approach—load avoidance, using natural energy sources, and mechanical equipment. Among the topics covered are shading, thermal envelope, passive heating and cooling, electric lighting, and HVAC. Case studies illustrate how certain buildings use techniques at all three tiers for heating, cooling,
and lighting. An appendix lists some of the more appropriate computer programs available to the architect for analysis at the schematic design stage.

**Heating, Cooling, Lighting** - Norbert Lechner 2014-10-13 Sustainable environmental control through building design Heating, Cooling, and Lighting is the industry standard text on environmental control systems with the emphasis on sustainable design. By detailing the many factors that contribute to the comfort in a building, this book helps architects minimize mechanical systems and energy usage over the life of the building by siting, building design, and landscaping to maximize natural heating, cooling, and lighting. This new fourth edition includes new information on integrated design strategies and designing for the Tropics. Resources include helpful case studies, checklists, diagrams, and a companion website featuring additional cases, an image bank, and instructor materials. Designing buildings that require less energy to heat, cool, and light means allowing the natural energy of the sun and wind to reduce the burden on the mechanical and electrical systems. Basic design decisions regarding size, orientation, and form have a great impact on the sustainability, cost, and comfort of a building. Heating, Cooling, and Lighting provides detailed guidance for each phase of a design project. Readers will:
- Understand the concept of sustainability as applied to energy sources Review the basic principles of thermal comfort, and the critical role of climate Learn the fundamentals of solar responsive design, including active and passive solar systems as well as photovoltaics Discover how siting, architectural design, and landscaping can reduce the requirements for mechanical and electrical systems In sustainable design, mechanical, and electrical systems should be used to only accomplish what the architect could not by the design of the building itself. With this in mind, designers require a comprehensive understanding of both the properties of energy and the human factors involved in thermal comfort. Heating, Cooling, and Lighting is the complete, industry-leading resource for designers interested in sustainable environmental control.

**Heat and Mass Transfer in Building Services Design** - Keith Moss 2002-09-11 Building design is increasingly geared towards low energy consumption. Understanding the fundamentals of heat transfer and the behaviour of air and water movements is more important than ever before. Heat and Mass Transfer in Building Services Design provides an essential underpinning knowledge for the technology subjects of space heating, water services, ventilation and air conditioning. This new text: *provides core understanding of heat transfer and fluid flow from a building services perspective *complements a range of courses in building services engineering *underpins and extends the themes of the author's previous books: Heating and Water Services Design in Buildings; Energy Management and Operational Costs in Buildings Heat and Mass Transfer in Building Services Design combines theory with practical application for building services professional and students. It will also be beneficial to technicians and undergraduate students on courses in construction and mechanical engineering.

**Heating, Cooling, Lighting** - Norbert M. Lechner 2021-09-20 The essential guide to environmental control systems in building design For over 25 years Heating, Cooling, Lighting: Sustainable Design Strategies Towards Net Zero Architecture has provided architects and design professionals the knowledge and tools required to design a sustainable built environment at the schematic design stage. This Fifth Edition offers cutting-edge research in the field of sustainable architecture and design and has been completely restructured based on net zero design strategies. Reflecting the latest developments in codes, standards, and rating systems for energy efficiency, Heating, Cooling, Lighting: Sustainable Design Strategies Towards Net Zero Architecture includes three new chapters: Retrofits: Best practices for efficient energy optimization in existing buildings Integrated Design: Strategies for synergizing passive and active design Design Tools: How to utilize the best tools to benchmark a building’s sustainability and net zero potential Heating, Cooling, Lighting: Sustainable Design Strategies Towards Net Zero Architecture is a go-to resource for practicing professionals and students in the fields of environmental systems technology or design, environmental design systems, construction technology, and sustainability technology.
Heating and Cooling of Buildings: Design for Efficiency-Kreider 2001-05-08

Masonry Heaters-Ken Matesz 2010-09-07
Masonry Heaters is a complete guide to designing and living with one of the oldest, and yet one of the newest, heating devices. A masonry heater’s design, placement in the home, and luxurious radiant heat redefine the hearth for the modern era, turning it into a piece of the sun right inside the home. Like the feeling one gets from the sun on a spring day, the environment around a masonry heater feels fresh. The radiant heat feels better on the skin. It warms the home both gently and efficiently. In fact, the value of a masonry heater lies in its durability, quality, serviceability, dependability, and health-supporting features. And it is an investment in self-sufficiency and freedom from fossil fuels. The book discusses different masonry heater designs, including variations extant in Europe, and explains the growth of their popularity in the United States beginning in the late 1970s. For the reader who may be familiar only with open fireplaces and metal woodstoves, Masonry Heaters will bring a new understanding and appreciation of massive heat storage and gentle-but-persistent radiant heat. Masonry heaters offer a unique comfort that is superior to that from convection heat from forced-air systems, and more personal than that offered by “radiant” floors. As Matesz demonstrates, the heat from the sun or from a masonry heater is genuine heat instead of just insulation against the loss of heat. Those who are looking to build, add onto, or remodel a house will find comprehensive and practical advice for designing and installing a masonry heater, including detailed discussion of materials, code considerations, and many photos and illustrations. While this is not a do-it-yourself guide for building a masonry heater, it provides facts every heater builder should know.
Professional contractors will find this a useful tool to consult, and homeowners considering a new method of home heating will find all they need to know about masonry heaters within these pages.

Passive Solar Architecture-David Bainbridge 2011-08-18
New buildings can be designed to be solar oriented, naturally heated and cooled, naturally lit and ventilated, and made with renewable, sustainable materials—no matter the location or climate. In this comprehensive overview of passive solar design, two of America’s solar pioneers give homeowners, architects, designers, and builders the keys to successfully harnessing the sun and maximizing climate resources for heating, cooling, ventilation, and daylighting. Bainbridge and Haggard draw upon examples from their own experiences, as well as those of others, of more than three decades to offer both overarching principles as well as the details and formulas needed to successfully design a more comfortable, healthy, and secure place in which to live, laugh, dance, and be comfortable. Even if the power goes off. Passive Solar Architecture also discusses “greener” and more-sustainable building materials and how to use them, and explores the historical roots of green design that have made possible buildings that produce more energy and other resources than they use.

Passive solar design techniques are becoming increasingly important in building design. This design reference book takes the building engineer or physicist step-by-step through the thermal analysis and design of passive solar buildings. In particular it emphasises two important topics: the maximum utilization of available solar energy and thermal storage, and the sizing of an appropriate auxiliary heating/cooling system in conjunction with good thermal control. Thermal Analysis and Design of Passive Solar Buildings is an important contribution towards the optimization of buildings as systems that act as natural filters between the indoor and outdoor environments, while maximizing the utilization of solar energy. As such it will be an essential source of information to engineers, architects, HVAC engineers and building physicists.

Advances in Passive Cooling-Mat Santamouris 2012-05-16
Following a rapid increase in the use of air conditioning in buildings of all types, the energy demand for powering such devices has become a significant cause for concern. Passive cooling is increasingly being thought of as the best alternative to air conditioning. This book offers the latest knowledge and techniques on passive cooling, enabling building professionals to understand the state of the art and employ relevant new strategies. With separate chapters
on comfort, urban microclimate, solar control, ventilation, ground cooling and evaporative and radiative cooling, this authoritative text will also be invaluable for architects, engineers and students working on building physics and low-energy design. Advances in Passive Cooling is part of the BEST series, edited by Mat Santamouris. The aim of the series is to present the most current, high quality theoretical and application oriented material in the field of solar energy and energy efficient buildings. Leading international experts cover the strategies and technologies that form the basis of high-performance, sustainable buildings, crucial to enhancing our built and urban environment.

**Heating and Cooling of Buildings**

Jan F. Kreider 2005-01-01

**Modeling, Design, and Optimization of Net-Zero Energy Buildings**

Andreas Athienitis 2015-03-30 Building energy design is currently going through a period of major changes. One key factor of this is the adoption of net-zero energy as a long term goal for new buildings in most developed countries. To achieve this goal a lot of research is needed to accumulate knowledge and to utilize it in practical applications. In this book, accomplished international experts present advanced modeling techniques as well as in-depth case studies in order to aid designers in optimally using simulation tools for net-zero energy building design. The strategies and technologies discussed in this book are, however, also applicable for the design of energy-plus buildings. This book was facilitated by International Energy Agency's Solar Heating and Cooling (SHC) Programs and the Energy in Buildings and Communities (EBC) Programs through the joint SHC Task 40/EBC Annex 52: Towards Net Zero Energy Solar Buildings R&D collaboration. After presenting the fundamental concepts, design strategies, and technologies required to achieve net-zero energy in buildings, the book discusses different design processes and tools to support the design of net-zero energy buildings (NZEBs). A substantial chapter reports on four diverse NZEBs that have been operating for at least two years. These case studies are extremely high quality because they all have high resolution measured data and the authors were intimately involved in all of them from conception to operating. By comparing the projections made using the respective design tools with the actual performance data, successful (and unsuccessful) design techniques and processes, design and simulation tools, and technologies are identified. Written by both academics and practitioners (building designers) and by North Americans as well as Europeans, this book provides a very broad perspective. It includes a detailed description of design processes and a list of appropriate tools for each design phase, plus methods for parametric analysis and mathematical optimization. It is a guideline for building designers that draws from both the profound theoretical background and the vast practical experience of the authors.

**Optimal Design and Retrofit of Energy Efficient Buildings, Communities, and Urban Centers**

Moncef Krarti 2018-03-27 Optimal Design and Retrofit of Energy Efficient Buildings, Communities, and Urban Centers presents current techniques and technologies for energy efficiency in buildings. Cases introduce and demonstrate applications in both the design of new buildings and retrofit of existing structures. The book begins with an introduction that includes energy consumption statistics, building energy efficiency codes, and standards and labels from around the world. It then highlights the need for integrated and comprehensive energy analysis approaches. Subsequent sections present an overview of advanced energy efficiency technologies for buildings, including dynamic insulation materials, phase change materials, LED lighting and daylight controls, Life Cycle Analysis, and more. This book provides researchers and professionals with a coherent set of tools and techniques for enhancing energy efficiency in new and existing buildings. The case studies presented help practitioners implement the techniques and technologies in their own projects. Introduces a holistic analysis approach to energy efficiency for buildings using the concept of energy productivity Provides coverage of individual buildings, communities and urban centers Includes both the design of new buildings and retrofitting of existing structures to improve energy efficiency Describes state-of-the-art energy efficiency technologies Presents several cases studies and examples that illustrate the analysis techniques and impact of energy efficiency technologies and controls.

**Heating and Cooling of Buildings**

Jan F.
Kreider 2002 Heating and Cooling of Buildings, Second Edition by Kreider and Rable covers technologies—from materials to computers—that are exerting a profound effect on the design and operation of buildings. Numerous examples are presented and solved to reinforce important concepts and software applications are integrated throughout. The contents of this edition have been expanded to include a chapter on economic analysis and optimization, new heating and cooling load procedures, more than 200 new homework problems, and new and simplified procedures for ground coupling heat transfer calculations. One of the most notable differences in the second edition of this book is that many of the appendices from the first edition of this book have been moved to the accompanying CD-ROM. The CD-ROM amounts to a searchable database of tables, charts, and information on building codes. For example, there are more than 1,000 tables in the electronic appendices that can be searched by major categories, a table list, or an index of topics. The CD also directs students to the central web site where several hundred links are maintained to help students find manufacturer and government data, browse in newsgroups, and find any corrections and updates to the text and date tables. Students have come to expect this kind interaction through Internet searches.

Heating and Cooling of Buildings-Jan F. Kreider 2005

Design of Mechanical and Electrical Systems in Buildings-J. Trost 2004 Using a concise and logical format that explains fundamentals in very simple terms—yet extensively—this book helps readers develop a working knowledge of the design decisions, equipment options, and operations of different building sub-systems. Readers will learn to design, size, and detail the different sub-systems installations, select fixtures and components, and integrate all the building sub-systems with site, building, foundations, structure, materials, and finishes. KEY TOPICS: Organized into four parts, topics include: Lighting chapters cover perceptions, lamps, luminaries, and design examples. Electrical chapters explain the energy form that lights, heats, cools, and powers buildings. Heating, ventilating, and air conditioning chapters show how to calculate heating/cooling costs for home/office, determine the size of air distribution components, and how to consider HVAC options and zoning for home/office. Water and plumbing chapters introduce water demand for buildings, plumbing systems for buildings, methods of site waterscape, and plumbing fixtures and components. MARKET: For architects, constructors, managers, occupants, and owners who wish to refine and improve their understanding of efficiency in building operation.

Exergy Analysis and Thermoeconomics of Buildings-Jose M Sala-Lizarraga 2019-10-01 Quantifying exergy losses in the energy supply system of buildings reveals the potential for energy improvement, which cannot be discovered using conventional energy analysis. Thermoeconomics combines economic and thermodynamic analysis by applying the concept of cost (an economic concept) to exergy, as exergy is a thermodynamic property fit for this purpose, in that it combines the quantity of energy with its quality factor. Exergy Analysis and Thermoeconomics of Buildings applies exergy analysis methods and thermoeconomics to the built environment. The mechanisms of heat transfer throughout the envelope of buildings are analyzed from an exergy perspective and then to the building thermal installations, analyzing the different components, such as condensing boilers, absorption refrigerators, microcogeneration plants, etc., including solar installations and finally the thermal facilities as a whole. A detailed analysis of the cost formation process is presented, which has its physical roots firmly planted in the second law of thermodynamics. The basic principles and the rules of cost allocation, in energy units (exergy cost), in monetary units (exergoeconomic cost), and in CO2 emissions (exergoenvironmental cost), based on the so-called Exergy Cost Theory are presented and applied to thermal installations of buildings. Clear and rigorous in its exposition, Exergy Analysis and Thermoeconomics of Buildings discusses exergy analysis and thermoeconomics and the role they could play in the analysis and design of building components, either the envelope or the thermal facilities, as well as the diagnosis of thermal installations. This book moves progressively from introducing the basic concepts to applying them. Exergy Analysis and Thermoeconomics of Buildings provides examples of specific cases throughout this book. These cases include real data, so that the results obtained are useful to interpret the inefficiencies and losses that truly
occur in actual installations; hence, the assessment of their effects encourages the manner to improve efficiency. Applies exergy analysis methods for the installation of building thermal facilities equipment components, including pipes, valves, heat exchangers, boilers and heat pumps. Helps readers determine the operational costs of heating and cooling building systems. Includes exergy analysis methods that are devoted to absorption refrigerators, adsorption cooling systems, basic air conditioning processes, ventilation systems and solar systems, either thermal and PV. Discusses the direct application of exergy analysis concepts, including examples of buildings with typical heating, DHW and air conditioning installations.

Energy Efficient Buildings - Eng Hwa Yap 2017-01-18 This book discusses energy efficient buildings and the role they play in our efforts to address climate change, energy consumption and greenhouse gas emissions by considering buildings and the construction sector's unique position along a critical path to decarbonisation from a multi-perspective and holistic viewpoint. Topics covered in the book range from daylighting, building topology comparison, building envelope design, zero energy homes in hot arid regions, life-cycle considerations and energy efficiency analysis to managing energy demand through equipment selection. Each chapter addresses an important aspect of energy efficient building and serves as a vital building block towards constructing a timely and relevant body of knowledge in energy efficient buildings.


Low Energy Cooling for Sustainable Buildings - Ursula Eicker 2009-03-23 This long-awaited reference guide provides a complete overview of low energy cooling systems for buildings, covering a wide range of existing and emerging sustainable energy technologies in one comprehensive volume. An excellent data source on cooling performance, such as building loads or solar thermal chiller efficiencies, it is essential reading for building services and renewable energy engineers and researchers covering sustainable design. The book is unique in including a large set of experimental results from years of monitoring actual building and energy plants, as well as detailed laboratory and simulation analyses. These demonstrate which systems really work in buildings, what the real costs are and how operation can be optimized - crucial information for planners, builders and architects to gain confidence in applying new technologies in the building sector. Inside you will find valuable insights into: the energy demand of residential and office buildings; facades and summer performance of buildings; passive cooling strategies; geothermal cooling; active thermal cooling technologies, including absorption cooling, desiccant cooling and new developments in low power chillers; sustainable building operation using simulation. Supporting case study material makes this a useful text for senior undergraduate students on renewable and sustainable energy courses. Practical and informative, it is the best up-to-date volume on the important and rapidly growing area of cooling.

Energy Efficiency and Management for Engineers - Mehmet Kanoglu 2020-02-05 Publisher's Note: Products purchased from Third Party sellers are not guaranteed by the publisher for quality, authenticity, or access to any online entitlements included with the product. Identify energy conservation opportunities in buildings and industrial facilities and implement energy efficiency and management practices with confidence. This comprehensive engineering textbook helps students master the fundamentals of energy efficiency and management and build confidence in applying basic principles of the field to practice. Written by a team of experienced energy efficiency practitioners and educators, Energy Efficiency and Management for Engineers features foundations and practice of energy efficiency principles for all aspects of energy production, distribution, and consumption. Packed with numerous worked-out examples and over 1,400 end-of-chapter problems, the book makes clear connections between theory and practice and provides the engineering rationale behind all energy efficiency measures. Coverage includes: • Energy management principles • Energy audits • Billing rate structures • Power factor • Specific energy consumption • Cogeneration • Boilers and steam systems • Heat recovery systems • Thermal insulation • Heating and cooling of buildings • Windows and infiltration • Electric motors •
Compressed air lines • Lighting systems • Energy efficiency practices in buildings • Economic analysis and environmental impacts

**Heating and Cooling of Buildings** - Jan F. Kreider 1994


Passive solar design refers to design strategies that minimize or eliminate the need to heat or cool a building mechanically. This sourcebook of details, drawings and case studies of passive solar buildings throughout the U.S. provides is a complete guide to passive solar design and construction.

**Heating, Cooling, Lighting** - Norbert Lechner 2001

Providing a qualitative, visual approach to heating, cooling, and lighting techniques, this book reflects and supports the decision-making process of architects involved in developing schematic designs. Based on a three-tier approach—load avoidance, optimum use of natural energies, and the selection of appropriate mechanical equipment—the book seeks to aid designers in providing all of a building's thermal and lighting needs while minimizing energy consumption and maximizing sustainability. It provides information on thermal comfort, mechanical heating and cooling systems, climate, passive heating and cooling, shading, site planning, daylight and artificial lighting, and conservation. Sun path diagrams, sizing tables, case studies, and approximately 1,000 photographs are included. Lechner teaches architecture at Auburn University.

**Solar Heating and Cooling** - Frank Kreith 1982

Discusses solar-energy concepts and requirements and the principles of heat transfer and details the designs and operation of economically feasible systems for heating and air-conditioning buildings

**Faber and Kell's Heating and Air Conditioning of Buildings** - Doug Oughton 2012-05-23

First published in 1997. Routledge is an imprint of Taylor & Francis, an informa company.


There is a growing concern about fluctuating energy prices, energy security, and the impact of climate change. Buildings are amongst the primary energy consumers in the world. This fact underlines the importance of targeting building energy use as a key to decreasing any nation's energy consumption. According to the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Research Strategic Plan 2010-2015, even limited deployment of Net-Zero-Energy buildings within this timeframe will have a beneficial effect by reducing the pressure for additional energy and power supply and the reduction of GHG emissions. The building sector is poised to significantly reduce energy use by incorporating energy-efficient strategies into the design, construction, and operation of new buildings and retrofits to improve the efficiency of existing buildings.

**Modern Architecture and Climate** - Daniel A. Barber 2020-07-07

How climate influenced the design strategies of modernist architects Modern Architecture and Climate explores how leading architects of the twentieth century incorporated climate-mediating strategies into their designs, and shows how regional approaches to climate adaptability were essential to the development of modern architecture. Focusing on the period surrounding World War II—before fossil-fuel powered air-conditioning became widely available—Daniel Barber brings to light a vibrant and dynamic architectural discussion involving design, materials, and shading systems as means of interior climate control. He looks at projects by well-known architects such as Richard Neutra, Le Corbusier, Lúcio Costa, Mies van der Rohe, and Skidmore, Owings, and Merrill, and the work of climate-focused architects such as MMM Roberto, Olgyay and Olgyay, and Cliff May. Drawing on the editorial projects of James Marston Fitch, Elizabeth Gordon, and others, he demonstrates how images and diagrams produced by architects helped conceptualize climate knowledge, alongside the work of meteorologists, physicists, engineers, and social scientists. Barber describes how this novel type of environmental media catalyzed new ways of thinking about climate and architectural design. Extensively illustrated with archival material, Modern Architecture and Climate provides global perspectives on modern architecture and its
evolving relationship with a changing climate, showcasing designs from Latin America, Europe, the United States, the Middle East, and Africa. This timely and important book reconciles the cultural dynamism of architecture with the material realities of ever-increasing carbon emissions from the mechanical cooling systems of buildings, and offers a historical foundation for today’s zero-carbon design.

The Passive Solar Energy Book - Edward Mazria 1979 Presents technical information on passive energy design and application, using illustrations and text, and includes 27 design patterns for use in designing a passive energy system.


Design with Energy - John Littler 1984-08-30 Originating from their work at Cambridge University on the design of energy efficient homes in Northern Europe, the authors consider the site constructions, building designs, available renewable energy sources, and servicing systems in different types of low energy houses.

Natural Ventilation for Infection Control in Health-care Settings - Y. Chartier 2009 This guideline defines ventilation and then natural ventilation. It explores the design requirements for natural ventilation in the context of infection control, describing the basic principles of design, construction, operation and maintenance for an effective natural ventilation system to control infection in health-care settings.

Climatic Design - Donald Watson 1983

The Passive Solar House - James Kachadorian 2006-07-31 Revised and Expanded Edition - Includes CD-ROM with Custom Design Software For the past ten years The Passive Solar House has offered proven techniques for building homes that heat and cool themselves, using readily available materials and methods familiar to all building contractors and many do-it-yourself homeowners. True to this innovative, straightforward approach, the new edition of this best-selling guide includes CSOL passive solar design software, making it easier than ever to heat your home with the power of the sun. Since The Passive Solar House was first published, passive solar construction expert James Kachadorian has perfected user-friendly, Windows-compatible software to supplement the design process explained in the book by allowing homeowners/designers to enter the specifications of their design and see how changing a variable will affect its energy efficiency. This is the building book for a world of climbing energy costs. Applicable to diverse regions, climates, budgets, and styles of architecture, Kachadorian’s techniques translate the essentials of timeless solar design into practical wisdom for today’s solar builders. Profiles of successful passive solar design, construction, and retrofit projects from readers of the first edition provide inspiration to first-time homebuilders and renovators alike.

Architectural Energy Efficiency - Nasrollahi, Farshad 2013-06-14 Energy saving in buildings through cost and energy-intensive measures, such as the application of additional building materials and technologies, is only possible with a great consumption of resources and CO2 emissions for their production. For low energy buildings, the investment costs, including user costs and governmental subsidies, are generally high, and construction is not always economically viable in consideration of the national capital in the present economic conditions of most countries. For these reasons, it is first of all necessary to apply cost and resource-efficient measures to save energy in buildings and then make use of additional cost and energy-intensive measures by improving the thermal envelope, the HVAC system or by installing energy generating systems. One of the most cost effective and ecological methods of energy saving in buildings is the reduction of energy requirements through climate responsive architecture. Due to the fact that energy saving through the optimization of architecture is not only cost-neutral, resource-efficient and carbon-neutral but also has a very high energy-saving potential, the first and most important strategy to save energy should be an optimized and climate responsive design. Energy saving through optimized architectural design is economically and ecologically sustainable. The development of building simulation science in the
last decades has made it easier to study the energy performance of buildings. Tools have made it possible to predict the complex behavior of buildings regarding the climate. Except for the comparison of different building typologies to find the most efficient, there are no other methods to achieve energy savings through the architectural design, which can be applied by a variety of building types and climates. Therefore, in order to encourage the optimization of architectural design, it is necessary to improve these methods which represent strategies to significantly reduce the energy demand of buildings. Architectural Energy Efficiency is a parametric method which separately studies the effects of various energy-related architectural factors on the energy demand of buildings by using dynamic energy simulations to find the, from an energy efficiency point of view, optimum value for each of these. The architectural factors include orientation, building elongation, building form, opening ratio in different orientations, sun shading, natural ventilation etc. The research process that led to the formulation of the Architectural Energy Efficiency method is based on a series of simulations carried out by a dynamic simulation software tool (DesignBuilder) to calculate the energy demands of a building with different variants for a single architectural feature. The aim of the simulations is to find an optimum set of energy-related variables that result in the best and most efficient energy performance for a specific building type and climate. This method of efficiency illustrates the effects different architectural features have on the various energy demands of buildings. The criteria are derived from the application of this method for a specific building occupation and climate, and can be applied in the design process of buildings, which leads to improvements of the energy performance and a reduction of resource consumption. As the architectural design affects the heating and cooling as well as the lighting energy demands of buildings, the optimum value of each factor must be based on these three aspects. The heating, cooling and lighting energy demands of buildings all behave very differently. Therefore, these three energy demands together (i.e. the sum of heating, cooling and lighting energy) must also be applied as a criterion to study the building energy performance and find the optimum value for each architectural feature. The criteria for selecting the best variant can not only be based on the total energy demand, but should also consider the primary energy demand, the CO2 emissions, energy costs (for heating, cooling and lighting), life cycle costs, etc. The application of these findings to the architectural design of buildings minimizes the energy demand, the CO2 emissions and energy costs of the building, does not, however, affect the initial building costs. The advantages of energy saving through optimizing the architectural design are not only the improvement of the building’s energy performance, but also the fact that the energy saving is cost and resource-efficient. This means that the energy demand of a building will decrease without increasing the investment costs of the building and without consuming any resources and energy for the production of additional building materials. The cost and resource efficiency contributes towards the economic and ecological sustainability of a building during the full life cycle.

**Passive Building Design** - N. K. Bansal 1994

Hardbound. The concepts, elements and design patterns of passive buildings are dealt with in this book. These patterns are a way to conserve energy in buildings or to provide more comfortable conditions inside the space through natural means. A systematic approach has been used in the presentation of the various concepts and elements of heating, cooling, combined heating and cooling, humidity control and daylighting. This has been achieved by describing the basic principles, their design aspects and performance, and illustrating with appropriate examples. The subject is covered in a compact yet comprehensive way. The information presented in the main text is supplemented by very useful appendices, which also include some case studies of passive buildings from all over the world.

**The Building Environment** - Vaughn Bradshaw

2010-09-29 Get the updated guide to active and passive control systems for buildings. To capitalize on today's rapidly evolving, specialized technologies, architects, designers, builders, and contractors work together to plan the mechanical and electrical equipment that controls the indoor environment of a building. The Building Environment: Active and Passive Control Systems, Third Edition helps you take advantage of design innovations and construction strategies that maximize the comfort, safety, and energy efficiency of buildings. From active HVAC systems to passive methods, lighting to on-site power generation, this updated edition explains...
how to strategically plan for and incorporate effective, efficient systems in today's buildings. It covers the underlying thermal theories and thermodynamic principles and focuses on design that enhances the building environment and minimizes the impact on the world's environment. The Building Environment goes beyond the ABCs of HVAC and covers: On-site power generation, including wind turbines, solar photovoltaic cells, fuel cells, and more. Plumbing systems, fire protection, signal systems, conveying systems, and architectural acoustics. Procedures and/or formulas for performing heat loss, heat gain, and energy use calculations, determining the rate of heat flow, calculating solar energy utilization, doing load calculations, and more. Details on the latest building codes and standards references. New information on the sustainable design of building systems and energy efficiency, including new technologies. The latest thinking and data on a building's impact on the environment, indoor air quality, and "sick building syndrome." Design economics, including the payback period, life-cycle cost, comparative value analysis, and building commissioning. A practical on-the-job tool for architects, designers, builders, engineers, contractors, and other specialists, this Third Edition is also a great reference for architecture students who will lead tomorrow's design teams.

Environmental Design of Urban Buildings-

The New Net Zero-Bill Maclay 2014-04 The new threshold for green building is not just low energy, it's net-zero energy. In The New Net Zero, sustainable architect Bill Maclay charts the path for designers and builders interested in exploring green design's new-frontier net-zero-energy structures that produce as much energy as they consume and are carbon neutral. In a nation where traditional buildings use roughly 40 percent of the total fossil energy, the interest in net-zero building is growing enormously--among both designers interested in addressing climate change and consumers interested in energy efficiency and long-term savings. Maclay, an award-winning net-zero designer whose buildings have achieved high-performance goals at affordable costs, makes the case for a net-zero future; explains net-zero building metrics, integrated design practices, and renewable energy options; and shares his lessons learned on net-zero teambuilding. Designers and builders will find a wealth of state-of-the-art information on such considerations as air, water, and vapor barriers; embodied energy; residential and commercial net-zero standards; monitoring and commissioning; insulation options; costs; and more. The comprehensive overview is accompanied by several case studies, which include institutional buildings, commercial projects, and residences. Both new-building and renovation projects are covered in detail. The New Net Zero is geared toward professionals exploring net-zero design, but also suitable for nonprofessionals seeking ideas and strategies on net-zero options that are beautiful and renewably powered.