



Energy Efficient Buildings Architecture, Engineering, and Environment

Dean Hawkes and Wayne Forster

Energy Efficient Buildings Architecture Engineering And Environment

**Vivien Lin Lu, Xi Chen, Jianheng
Chen, Kai Jiao**



Energy Efficient Buildings Architecture Engineering And Environment:

Energy Efficient Buildings Dean Hawkes, Wayne Forster, 2002-07-30 An examination of how energy efficiency can be enhanced by integrating advances in architecture and engineering Exploring the evolving relationship between architecture and engineering this book examines the environmental function and performance of buildings in the twenty first century Critical studies of outstanding recent building projects around the world reveal the many innovative ways designers can integrate architecture and engineering to produce buildings that are both attractive and energy efficient **A Handbook of Sustainable Building Design and Engineering** Dejan Mumovic, Mat Santamouris, 2018-10-30 The second edition of this authoritative textbook equips students with the tools they will need to tackle the challenges of sustainable building design and engineering The book looks at how to design engineer and monitor energy efficient buildings how to adapt buildings to climate change and how to make buildings healthy comfortable and secure New material for this edition includes sections on environmental masterplanning renewable technologies retrofitting passive house design thermal comfort and indoor air quality With chapters and case studies from a range of international interdisciplinary authors the book is essential reading for students and professionals in building engineering environmental design construction and architecture Energy Efficient Building Design Ana-Maria Dabija, 2020-04-11 This book is the result of recent research that deals with the built environment and innovative materials carried out by specialists working in universities and centers of research in different professional fields architecture engineering physics and in an area that spans from the Mediterranean Sea to the Persian Gulf and from South Eastern Europe to the Middle East This book takes the necessity of re shaping the concept of building design in order to transform buildings from large scale energy consumers to energy savers and producers into consideration The book is organized in two parts theory and case studies For the theoretical part we chose from the wide range of sources that provide energy efficient materials and systems the two that seem to be endless the sun and vegetation Their use in building products represents a tool for specialists in the architectural design concept The case studies presented analyze different architectural programs in different climates from new buildings to rehabilitation approaches and from residential architecture to hospitals and sports arenas each case emphasizes the interdisciplinarity of the building design activity in order to help readers gain a better understanding of the complex approach needed for energy efficient building design

Advancements in Sustainable Architecture and Energy Efficiency González-Lezcano, Roberto A., 2021-06-18 Thermal comfort and indoor air quality IAQ issues have gained significant interest in the scientific and technical community involved in building performance analysis and other related subjects In terms of thermal comfort the achievement and maintenance of a thermally acceptable indoor environment is affected by energy costs and energy poverty is a widespread problem globally There is a call for energy efficient architecture for a developed and sustainable world However with the use of renewable energy that increased considerably in recent years new technical challenges arose for the energy sector

Consumers are key players in this context as flexibility in demand is crucial to cope with the intermittent nature of most renewable energy sources Active demand side participation is particularly important to ensure the efficient use of locally and globally available energy Sustainability human comfort and healthy living environments have become top priorities

Advancements in Sustainable Architecture and Energy Efficiency explores how housing is a key health factor for individuals and looks at factors such as air quality ventilation hygrothermal comfort lighting physical environment building efficiency and other areas as important pieces in healthy architecture It discusses how the poor application of these parameters can directly affect human health and how sustainable architecture provides a solution Beyond just labeling the important facets of architecture for healthy living this book will look at different perspectives of energy consumption and demand to ensure sustainable energy increased energy efficiency improved energy policies and reasonable energy costs for homes This book is ideal for architects designers engineers energy engineers environmental scientists practitioners researchers academicians and students interested in architecture that is both conducive to healthy living and energy efficiency

Energy Efficient Buildings Zhiqiang John Zhai, 2022-08-19 Energy Efficient Buildings A complete and authoritative discussion of the fundamentals of designing and engineering energy efficient buildings In Energy Efficient Buildings Fundamentals of Building Science and Thermal Systems distinguished engineer and architect Dr John Zhai delivers a comprehensive exploration of the design and engineering fundamentals of energy efficient buildings The book introduces the fundamental knowledge calculations analyses and principles used by designers of energy efficient buildings and addresses all essential elements of the discipline An essential guide for students studying civil architectural mechanical and electrical engineering with a focus on energy building systems and building science the book provides practical in class materials examples and actual design practices as well as end of chapter questions with solutions and sample group projects Readers will find A thorough introduction to the cross disciplinary approach to the design of energy efficient buildings Comprehensive explorations of all critical elements of energy efficient building design including standards and codes psychometrics microclimate thermal comfort indoor air quality HVAC systems and more In depth discussions of the foundational knowledge calculations analysis and principles needed to design energy efficient buildings Practical in class examples and end of chapter questions with solutions for students and design guidance and sample group projects for use in course lectures and actual design practices Perfect for graduate and advanced undergraduate students studying building environmental systems building systems in construction and mechanical and electrical systems in construction Energy Efficient Buildings Fundamentals of Building Science and Thermal Systems will also earn a place in the libraries of practicing civil architectural and mechanical engineers

Building Systems Integration for Enhanced Environmental Performance Shahin Vassigh, Jason R. Chandler, 2011 Looks at the issues of sustainability and environmental impact in the field of building design and architecture This book addresses sustainability in building design through development of a series of examples presented as three dimensional

models of well integrated building systems *Architecture and Energy* William W. Braham, Daniel Willis, 2013-07-18 Does energy consumption influence architectural style Should more energy efficient buildings look different Can that look be used to explain or enhance their performance Architecture and Energy provides architects and architectural theorists with more durable arguments for environmental design decisions arguments addressing three different scales or aspects of contemporary construction By drawing together essays from the leading experts in the field this book engages with crucial issues in sustainable design such as The larger role of energy in forming the cultural and economic systems in which architecture is conceived constructed and evaluated The different measures and meanings of energy performance and how those measures are realized in buildings The specific ways in which energy use translates into the visible aspects of architectural style Drawing on research from the UK US Europe and Asia the book outlines the problems surrounding energy and architecture and provides the reader with a considered overview of this important topic **eWork and eBusiness in Architecture, Engineering and Construction** Ardeshir Mahdavi, Bob Martens, Raimar Scherer, 2014-08-21 In the last two decades the biannual ECPPM European Conference on Product and Process Modelling conference series has provided a unique platform for the presentation and discussion of the most recent advances with regard to the ICT Information and Communication Technology applications in the AEC FM Architecture Engineering Construction and A Handbook on Low-Energy Buildings and District-Energy Systems L.D. Danny Harvey, 2012-08-21 Winner of Choice Magazine Outstanding Academic Titles for 2007 Buildings account for over one third of global energy use and associated greenhouse gas emissions worldwide Reducing energy use by buildings is therefore an essential part of any strategy to reduce greenhouse gas emissions and thereby lessen the likelihood of potentially catastrophic climate change Bringing together a wealth of hard to obtain information on energy use and energy efficiency in buildings at a level which can be easily digested and applied Danny Harvey offers a comprehensive objective and critical sourcebook on low energy buildings Topics covered include thermal envelopes heating cooling heat pumps HVAC systems hot water lighting solar energy appliances and office equipment embodied energy buildings as systems and community integrated energy systems cogeneration district heating and district cooling The book includes exemplary buildings and techniques from North America Europe and Asia and combines a broad holistic perspective with technical detail in an accessible and insightful manner Sustainability, Energy and Architecture Ali Sayigh, 2013-09-25 This unique volume offers insights from renowned experts in energy efficient building from the world over providing a multi faceted overview of the state of the art in energy efficient architecture It opens by defining what constitutes a sustainable building suggesting bases for sorely needed benchmarks then explains the most important techniques and tools available to engineers and architects exploring green building technologies It covers such pivotal issues as daylighting LED lighting integrating renewables such as solar thermal and cooling retrofitting LEED and similar certification efforts passive houses net zero and close zero structures water recycling and much more Highlighting best

practices for commercial buildings and private homes in widely varied climates and within vastly different socio economic contexts this illustrated reference will guide architects and engineers in making sustainable choices in building materials and methods Explains the best methods and materials to support energy efficient building Features case studies by experts from a dozen countries demonstrating how sustainable architecture can be achieved in varied climates and economies Covers both new constructions and retrofitting of existing structures Toward Energy-Efficient Buildings Vivien Lin Lu,Xi Chen,Jianheng Chen,Kai Jiao,2025-02-17 Towards Energy Efficient Buildings Envelope Technologies and Sustainable Energy Systems examines the intersection of building design and energy systems analysis paving the way to sustainable efficient buildings and our communal energy future This book begins by outlining the major energy challenges for buildings and the fundamentals and opportunities in envelope technology for their increasing the efficiency of their energy systems Close analysis of various technologies is then carried out including case studies and demonstrations of impact assessment techniques The ways in which these technologies interact with energy systems within the building are drawn out and clarified for a range of readers Finally detailed guidance on energy system assessment and analysis is provided Bringing together these two essential disciplines for sustainable living Towards Energy Efficient Buildings will support energy engineers researchers and students of energy systems in developing technologies for energy efficient sustainable buildings Breaks down the fundamentals of building envelope design for an energy engineer readership Includes a variety of case studies and practical technologies with clear real world impacts on building energy systems and management Leads the reader through comprehensive assessment methodologies to analysis energy system outcomes and enable sustainable cities for the future **Guideline for sustainable, energy efficient architecture and construction** Rückert, Klaus,Shahriari, Effatolsadat,2014-07-22 Nowadays there is an ever growing awareness regarding inevitable importance of sustainable development and its sub topics such as environment protection ecology resource saving energy efficiency etc Due to massive and rapid development in recent years this topic is getting more crucial in developing countries for instance Iran It is getting more obvious that most of the development activities in absence of precise analysis of current conditions as well as consequences of such activities will lead to devastation of natural resources The resources that is essential for further development of the country Therefore It is necessary to deal with sustainable development and environmental issues from the broader perspective where includes items underlying immediate causes of environmental impact and at the same time tries to improve them Sustainability or sustainable development is an umbrella covering many issues and aspects among them energy which is the key item because energy consumption of buildings could have an impact on environment more than other aspects Considering the huge portion of energy consumption in construction industry and housing sector paying special attention to improvements in this sector is essential Following this goal the aim of this publication is to highlight procedures and practices which promote sustainable construction that is about creating a better quality of building and more healthy

places to live in Procedure of sustainable design includes various approaches and methods to develop energy efficient and environmentally sensitive buildings Such approaches and methods demonstrate how to design develop and construct all buildings in general and residential buildings in particular Among various approaches towards sustainability Passive solar strategies are well known thanks to their cost efficiency and context friendliness of its principals and measures The approach of passive design architectural strategies could be considered as the most applicable approach for resource saving and sustainability thinking about special situation of Iran in particular and the Mena region in general Such an approach requires paying special attention to climate social characteristics of current or prospective inhabitants topographical physical characteristics as well as architectural characteristics of the understudied area The relationships and interactions among society building and its architecture and climate is Site specific and dynamic Therefore they should be studied and properly analyzed throughout a specific project process for each certain place The most expecting outcomes are precise definitions of passive design strategies generally for buildings in MENA Region and especially for Iran This publication is prepared in the young cities project framework as the reasonable outcome of the developed pilot projects The book starts with introducing the target group related definitions and a brief overview on a conventional approach and its impact on environment This chapter ends up with a brief review on benefits of applying sustainable guidelines As the next step after analyzing the climate and its relationship with thermal comfort and building the main principals of passive solar design are introduced The selected principles are orientation day lighting shading thermal mass insulation and ventilation After a brief introduction of the principals each one is explained in detail through its general principles and design strategies Sustainable construction is examined based on its main pillars construction systems building elements ecological building materials and applicable measures for building physic Construction systems are sorted out in six main groups as block work brick infill block work lightweight block infill conventional panels light weight steel frame tunnel form structural system and precast modular All selected systems are introduced based on following factors brief description of the building concept factory production insulation wastage finishes labor installation transport lifting services hydronic cooling heating and safety Then main building elements are examined Here the elements are limited to foundations walls floors roofs doors and windows After a short description different types of each element are introduced Ecological building materials are investigated in chapter four To find a base to compare several common criteria are selected such as embodied energy pollution and waste local production reusability and recyclability durability and interdependency Applicable measures for building physic are examined in chapter five The selected main measures are as follows insulation glazing thermal mass day lighting shading ventilation and air tightness After describing the general principles of each measure several recommendations in frame of design considerations are provided Die enorme Bedeutung nachhaltiger Projekte wie Umweltschutz kologie sparsamer Umgang mit Rohstoffen Energieeffizienz usw dringt immer st rker in unser Bewusstsein Aufgrund der massiven und rasanten

Entwicklung in den Schwellenländern z.B. Iran gewinnen Umweltschutz und Nachhaltigkeit immer mehr an Relevanz. Ein einseitiges Wirtschaftswachstum ohne Berücksichtigung ökologischer und klimatischer Bedingungen verursacht die Zerstörung der Umwelt und Rohstoffe Ressourcen, die für die weitere Entwicklung der Länder unverzichtbar sind. Es ist unumgänglich sich umfassend mit nachhaltiger Entwicklung und ökologischen Aspekten auseinanderzusetzen, die unmittelbaren Auswirkungen auf die Umwelt zu erfassen und gleichzeitig Möglichkeiten einer Optimierung aufzuzeigen. Nachhaltigkeit und Umweltschutz erfassen eine Vielzahl von Themen und Aspekten, wozu auch der Energieverbrauch ein wesentlicher Faktor ist, da der Energieverbrauch in Gebäuden den größten Einfluss auf die Umweltbilanz hat. In Anbetracht des enormen Energieverbrauchs in Bauwirtschaft und Wohnungsbau ist es unerlässlich gerade in diesem Bereich eine Optimierung in der weiteren Entwicklung zu verfolgen. Diesem Ziel folgend werden in dieser Publikation Verfahren und Methoden für nachhaltige Bauweisen unter Berücksichtigung einer besseren Bauqualität und gesundheitlicher Aspekte erläutert. Die Maßnahmen nachhaltigen Designs beinhalten verschiedene Ansätze und Methoden: energieeffiziente und umweltfreundliche Gebäude zu entwickeln. Sie zeigen Entwurf, Konstruktion und bauliche Ausführung von Gebäuden im Allgemeinen und Wohngebäuden im speziellen. Neben den verschiedenen Ansätzen sind die passive solar strategies die wohl namhaftesten Methoden, da diese sehr rentabel und daher für Bauherren attraktiv sind. Angesichts der speziellen Situation im Iran, im Besonderen und der MENA Region im Allgemeinen konnten die passiven Design Architektur Strategien als eine der am besten anzuwendenden Methoden für Rohstoffeffizienz und Nachhaltigkeit betrachtet werden. Dies setzt eine besondere Berücksichtigung des dortigen Klimas, der sozialen Charakteristiken derzeitiger oder zukünftiger Einwohner, als auch der topographisch physischen und architektonischen Charakteristiken der betroffenen Region voraus. Beeinflussung und Beziehungen zwischen Gesellschaft, Gebäuden, Architektur und Klima sind lokal spezifisch und dynamisch. Deshalb sollten diese Faktoren für jeden Standort neu geprüft und analysiert werden. Die Resultate dieser Analysen allgemein für Gebäude in der MENA Region und im Besonderen im Iran zeigen deutlich die Überlegenheit von passiven Designstrategien. Diese Publikation ist das Resultat der entwickelten Pilotprojekte im Rahmen des Young Cities Projektes. Sie beginnt mit der Vorstellung der Zielgruppe, relevanten Definitionen und einem kurzem Überblick des konventionellen Ansatzes und dessen Einfluss auf die Umwelt. Das Kapitel endet mit einem kurzen Rückblick über den Nutzen nachhaltiger Bauweise. Nach Analyse des Klimas und seine Beziehung zu thermischem Komfort und Gebäuden werden die wichtigsten Prinzipien passiver Solarenergie vorgestellt: Orientierung, Tageslicht, Schatten, thermale Masse, Isolierung und Ventilierung. Ihre Grundlagen und Designstrategien detailliert erläutert. Nachhaltige Konstruktion und deren Hauptpfeiler: Bausysteme, Bauelemente, ökologische Bauelemente und anwendbare Maßnahmen für die Bauphysik werden anschließend beleuchtet. Dabei wurden die Konstruktionssysteme in sechs Hauptgruppen gegliedert: Ziegeleinflung, leichtgewichtige Ziegeleinflung, klassische Flurnde, leichtgewichtige Stahlrahmen, tunnelförmige Struktursysteme und vorgefertigte Modelle. Anhand folgender Faktoren werden diese eingehend dargestellt: Baukonzept, Fabrikproduktion.

Isolierung Abnutzung Verarbeitung Arbeitsaufwand Installation Transport Beförderung Services hydronische Khlung Heizung und Sicherheit Die Hauptbauelemente wie Unterbau Wnde Boden Dcher Trennen und Fenster werden beschrieben und verschiedene Baureihen dieser vorgestellt Das vierte Kapitel befasst sich mit kologischen Baumaterialien Um hierbei eine vergleichbare Basis zu finden wurden gemeinsame Kriterien ausgewhlt graue Energie Verschmutzung und Abfall lokale Produktion Wiederverwendung und Recycling Nachhaltigkeit und Interdependenzen Im fnften Kapitel werden anwendbare Manahmen fr die Bauphysik wie Isolierung Lasur Wrmemasse Tageslicht Schatten Ventilation und Luftdichte untersucht deren Grundlagen beschrieben und Empfehlungen bezuglich der Gestaltung prsentiert

Data-driven BIM for Energy Efficient Building Design Saeed Banihashemi, Hamed Golizadeh, Farzad Pour Rahimian, 2022-12-16 This research book aims to conceptualise the scale and spectrum of Building Information Modelling BIM and Artificial Intelligence AI approaches in energy efficient building design and to develop its functional solutions with a focus on four crucial aspects of building envelop building layout occupant behaviour and heating ventilation and air conditioning HVAC systems Drawn from theoretical development on the sustainability informatics and optimisation paradigms in built environment the energy efficient building design will be marked through the power of data and BIM intelligent agents during the design phase It will be further developed via smart derivatives to reach a harmony in the systematic integration of energy efficient building design solutions a gap that is missed in the extant literature and that this book aims to fill This approach will inform a vision for future and provide a framework to shape and respond to our built environment and how it transforms the way we design and build By considering the balance of BIM AI and energy efficient outcomes the future development of buildings will be regenerated in a direction that is sustainable in the long run This book is essential reading for those in the AEC industry as well as computer scientists

Architecture and Energy Efficiency Sergi Costa Duran, 2011 Architecture and Energy Efficiency

Design Solutions for nZEB Retrofit Buildings Rynska, Elzbieta, Kozminska, Urszula, Zinowiec-Cieplik, Kinga, Rucinska, Joanna, Szybinska-Matusiak, Barbara, 2018-03-02 Construction projects once they are completed are intended to exist in the skylines of cities and towns for decades Sustainable technologies seek to take these existing structures and make them environmentally friendly and energy efficient Design Solutions for nZEB Retrofit Buildings is a critical scholarly resource that examines the importance of creating architecture that not only promotes the daily function of these buildings but is also environmentally sustainable Featuring a broad range of topics including renewable energy sources solar energy and energy performance this book is geared toward professionals students and researchers seeking current research on sustainable options for upgrading existing edifices to become more environmentally friendly

Green Structures Satyajit Ghosh, Abhinav Dhaka, 2015-07-15 Accessible to undergraduates in civil structural and environmental engineering graduate students and researchers town planners and architects worldwide the content of this book not only comes from courses on energy efficient buildings taught by the authors but also from new and original research This

definitive resource has an enduring appeal for all those concerned with green structures as it addresses overarching topics including energy efficiency in buildings siting and microclimate building form extant fabric and fabric of the future renewable energy and green building ratings

Education, Environmental Attitudes and the Design Professions Traci R. Rider, 2006

The Architect's Engineer Sir Nigel Thompson, 2022-06-07 Sir Nigel Thompson walked to school around the bomb craters of the London Blitz it made him want to build things rather than knock them down After studying structural engineering in Africa he worked on hospitals and theaters in London and later headed the team that designed University of Qatar He went on to design Embankment Place a massive office complex built over London's Charing Cross railway station Turning from building to rebuilding he explored construction opportunities for British firms during the Gulf War in Kuwait's still burning oil fields Following the 1999 bombing of Serbia and Kosovo he led a reconstruction task force in Kosovo at the request of UK Prime Minister Tony Blair for which he was knighted Thompson's memoir details his long career in architectural design and construction and in restorative development

Alternative Envelope Components for Energy-Efficient Buildings Ana-Maria Dabija, 2021-08-24 This book examines ways of saving energy by using green roofs and facades solar devices such as building integrated photovoltaics BIPV and thermal solar panels as components of energy efficient building envelopes The author takes an interdisciplinary multidisciplinary approach to the subject that analyzes several different scientific fields connected to building research sustainability sustainable architecture energy efficiency in buildings and building envelopes while approaching other collateral domains including history archaeology botanics physics engineering and landscape architecture Alternative Envelope Components for Energy Efficient Buildings will be a welcome resource for researchers students and postgraduates in the fields of energy building materials and renewable energy as well as architects engineers and specialists in industries related to building products Looks at the impact of building envelopes on energy usage Offers readers an introduction to the principles of sustainability Presents passive and active approaches to using solar devices

Building Services Design for Energy Efficient Buildings Paul Tymkow, Savvas Tassou, Maria Kolokotroni, Hussam Jouhara, 2013-07-18 The role and influence of building services engineers is undergoing rapid change and is pivotal to achieving low carbon buildings However textbooks in the field have largely focused on the detailed technicalities of HVAC systems often with little wider context This book addresses that need by embracing a contemporary understanding of energy efficiency imperatives together with a strategic approach to the key design issues impacting upon carbon performance in a concise manner The key conceptual design issues for planning the principal systems that influence energy efficiency are examined in detail In addition the following issues are addressed in turn Background issues for sustainability and the design process Developing a strategic approach to energy efficient design How to undertake load assessments System comparison and selection Space planning for services Post occupancy evaluation of completed building services In order to deliver sustainable buildings a new perspective is needed amongst building and services engineering

designers from the outset of the conceptual design stage and throughout the whole design process In this book students and practitioners alike will find the ideal introduction to this new approach

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