



Hugo Hens

Building Physics — Heat, Air and Moisture

**Fundamentals, Engineering Methods,
Material Properties**

With Exercises

Fourth Edition



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Building Physics Heat Air And Moisture

**Paul Fazio, Hua Ge, Jiwu Rao, Guylaine
Desmarais**



Building Physics Heat Air And Moisture:

Building Physics - Heat, Air and Moisture Hugo S. L. Hens, 2012-10-04 Note New editions of this book have been published the 3rd edition in 2017 and the 4th edition in September 2023 Bad experiences with construction quality the energy crises of 1973 and 1979 complaints about sick buildings thermal acoustical visual and olfactory discomfort the need for good air quality the move towards more sustainability all have accelerated the development of a field which until some 40 years ago was hardly more than an academic exercise building physics Building physics combines several knowledge domains such as heat and mass transfer building acoustics lighting indoor environmental quality and energy efficiency In some countries also fire safety is included Through the application of existing physical knowledge and the combination with information coming from other disciplines the field helps to understand the physical phenomena governing assembly building envelope whole building and built environment performance although for the last the wording urban physics is used Building physics has a true impact on performance based building design This volume focuses on heat air moisture transfer and its usage in building engineering applications Building Physics - Heat, Air and Moisture ,2012 **Building Physics: Heat, Air and Moisture, includes eBook**

Hugo S. L. Hens, 2017-12-04 Bad experiences with construction quality the energy crises of 1973 and 1979 complaints about sick buildings thermal acoustical visual and olfactory discomfort the need for good air quality the move towards more sustainability all these have accelerated the development of a field that for a long time was hardly more than an academic exercise building physics in English speaking countries sometimes referred to as building science The discipline embraces domains such as heat and mass transfer building acoustics lighting indoor environmental quality and energy efficiency In some countries fire safety is also included Through the application of physical knowledge and its combination with information coming from other disciplines the field helps to understand the physical phenomena governing building parts building envelope whole buildings and built environment performance although for the last the wording urban physics is used Today building physics has become a key player on the road to a performance based building design The book deals with the description analysis and modeling of heat air and moisture transport in building assemblies and whole buildings with main emphasis on the building engineering applications including examples The physical transport processes determine the performance of the building envelope and may influence the serviceability of the structure and the whole building Compared to the second edition in this third edition the text has partially been revised and extended

Building Physics - Heat, Air and Moisture Hugo S. L. Hens, 2023-11-06 Erfahrungen mit Sch den an Geb uden die Energiekrise zwischen 1973 und 1979 Klagen ber das Sick Building Syndrom mangelhafter Komfort hinsichtlich Raumklima Schallschutz und L rmschutz das Bed rfnis nach Behaglichkeit und guter Luftqualit t die Entwicklung hin zu Energieeffizienz Dekarbonisierung und Nachhaltigkeit all dies hat die Entwicklung einer Disziplin beschleunigt die lange Zeit kaum mehr als eine akademische bung war die Bauphysik Sie vereint Thermodynamik und Str mungslehre Bau und Raumakustik Tageslicht

und Beleuchtung Raumluftqualität Energieeffizienz und in einigen Ländern auch den Brandschutz zu einem Wissensgebiet. Die Anwendung der physikalischen Grundlagen und ihre Zusammenführung mit den Erkenntnissen aus anderen Disziplinen fördert das Verständnis über das physikalische Verhalten von Bauteilen Gebäuden bis hin zur gebauten Umwelt, was sich in der Stadtbauphysik widerspiegelt. Heute ist die Bauphysik ein wichtiger Akteur auf dem Weg zu leistungsfähigen Gebäuden hinsichtlich Gebrauchstauglichkeit und Energieeffizienz in Neubau und Bestand. Dieses Buch befasst sich mit dem Wärme- und Feuchtetransport in Baukonstruktionen Gebäudeteilen und ganzen Gebäuden mit Schwerpunkt auf den Anwendungen in der Planungspraxis. Im Vergleich zur dritten Auflage wurde diese vierte Auflage in Kapitel 1 um die physikalische Bestimmung der Wärmeleitfähigkeit von Materialien sowie eine ausführliche Diskussion aller Auswirkungen dickerer Dämmschichten erweitert. In Kapitel 2 wurden zusätzliche Informationen zum Winddruck und zur Bewertung der Tauwasserbildung im Inneren von Bauteilen hinzugefügt, während ein neues Kapitel 4 über Materialeigenschaften aufgenommen wurde. Das gesamte Buch einschließlich der Abbildungen wurde bearbeitet und wo nötig neu strukturiert.

Applied Building Physics Hugo S. L. Hens, 2012-01-09 Die Energiekrise der 1970er Jahre häufig auftretende Feuchteprobleme, Klagen über das Sick Building Syndrom und mangelnden Komfort hinsichtlich Raumklima und Behaglichkeit und nicht zuletzt das Bemühen um Nachhaltigkeit haben die Bauphysik zu einem Innovationsmotor auf dem Gebäudesektor gemacht. Dabei war die gesellschaftliche Forderung nach Energieeinsparung in Gebäuden ohne Gebrauchseinschränkungen der Auslöser für die ganzheitliche Planung. Wie alle Ingenieurwissenschaften ist auch die Bauphysik anwendungsorientiert, weshalb sich nach einem ersten Buch über die Grundlagen das vorliegende zweite Buch mit den Hintergründen der Gebrauchstauglichkeit und den Anforderungen an Energieeffizienz in Gebäuden befasst. Außenklimabedingungen und Raumklimaberechnungen werden diskutiert, Energieverluste und -gewinne werden für Gebäude und separat für die Gebäudehülle untersucht. Die wichtigen physikalischen Eigenschaften für den gekoppelten Wärme- und Feuchtetransport durch Baukonstruktionen werden für zahlreiche Materialien aufgeführt. Für das Buch stützt sich der Autor auf seine Erfahrungen aus 35 Jahren Lehre der Bauphysik für Architekten und Bauingenieure und 40 Jahre Tätigkeit in der Forschung und als Beratender Ingenieur.

Building Physics Sašo Medved, 2021-10-01 The book presents the theoretical background of building physics dealing with the evaluation of physical phenomena related to heat transfer and energy use in buildings, water and water vapour transfer in building structures, daylighting and electric lighting of buildings, sound transmission in building structures and protection against noise, the occurrence and spread of fires in buildings and the thermal response of cities. It contains numerical and computational evaluation methods, numerous computational case studies and examples of experimental analyses. The book demonstrates that the considered physical processes affect the quality of living and working comfort in indoor and outdoor environment.

Heat-air-moisture Transport Phalguni Mukhopadhyaya, M. K. Kumaran, 2007

Numerical methods for diffusion phenomena in building physics Nathan Mendes, Marx Chhay, Julien Berger, Denys

Dutykh, 2017-05-19 This book intends to stimulate research in simulation of diffusion problems in building physics by first providing an overview of mathematical models and numerical techniques such as the finite difference and finite element methods traditionally used in building simulation tools Then nonconventional methods such as reduced order models boundary integral approaches and spectral methods are presented which might be considered in the next generation of building energy simulation tools The advantage of these methods includes the improvement of the numerical solution of diffusion phenomena especially in large domains relevant to building energy performance analysis *Research in Building Physics and Building Engineering* Paul Fazio, Hua Ge, Jiwu Rao, Guylaine Desmarais, 2020-11-26 Buildings influence people They account for one third of energy consumption across the globe and represent an annual capital expenditure of 7% 10% of GNP in industrialized countries Their lifetime operation costs can exceed capital investment Building Engineering aims to make buildings more efficient safe and economical One branch of this discipline Building Physics Science has gained prominence with a heightened awareness of such phenomena as sick buildings the energy crisis and sustainability and considering the performance of buildings in terms of climatic loads and indoor conditions The book reflects the advanced level and high quality of research which Building Engineering and Building Physics Science in particular have reached at the beginning of the twenty first century It will be a valuable resource to engineers architects building scientists consultants on the building envelope researchers and graduate students

Hygrothermal Numerical Simulation Tools Applied to Building Physics João M.P.Q. Delgado, Eva Barreira, Nuno M.M. Ramos, Vasco Peixoto de Freitas, 2012-12-15 This book presents a critical review on the development and application of hygrothermal analysis methods to simulate the coupled transport processes of Heat Air and Moisture HAM transfer for one or multidimensional cases During the past few decades there has been relevant development in this field of study and an increase in the professional use of tools that simulate some of the physical phenomena that are involved in Heat Air and Moisture conditions in building components or elements Although there is a significant amount of hygrothermal models referred in the literature the vast majority of them are not easily available to the public outside the institutions where they were developed which restricts the analysis of this book to only 14 hygrothermal modelling tools The special features of this book are a a state of the art of numerical simulation tools applied to building physics b the boundary conditions importance c the material properties namely experimental methods for the measurement of relevant transport properties and d the numerical investigation and application The main benefit of the book is that it discusses all the topics related to numerical simulation tools in building components including state of the art and applications and presents some of the most important theoretical and numerical developments in building physics providing a self contained major reference that is appealing to both the scientists and the engineers At the same time this book will be going to the encounter of a variety of scientific and engineering disciplines such as civil and mechanical engineering architecture etc The book is divided in several chapters that intend to be a resume of the current state of

knowledge for benefit of professional colleagues

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