Book Review

Morris Grenfell Davies: Building Heat Transfer
John Wiley & Sons, Ltd.,
Chichester, West Sussex, PO19 8SQ, England

A new specialist book has been published by John Wiley & Sons Ltd. (Chichester, England) this year. The author of the book is Morris Grenfell Davies, professor of the University of Liverpool. The book deals with the ways of heat transfer in boundary structures of buildings with theoretical exacting in 19 chapters, 499 pages.

The main Chapters of this professional book consist of the following topics: In the introductory chapter, the importance of knowledge of the heat circulation in a building is presented which determines the thermal comfort. The comfort diagrams by P.O. Fanger are presented. Among the basic sizing rudiments, the ambient temperature, the design temperature, and the degree-day value are covered. In reporting the traditional building heating model, the filtration loss, the convection heat transfer, the heat loss from a cylinder, and the seasonal heat need are detailed.

A separate Chapter is dedicated to the physical constants of materials. Characteristics of gases are shown on the basis of the kinetic gas theory while the representative heat engineering values of solid building materials are also summarised. Chapter 3 deals with heat flow through the boundary structures, walls and floors, with theoretical exacting. One-, two- and three-dimensional models of heat loss are presented followed by heat flow through corners (Macey model, Schwarz–Christoffel transformation). A separate Chapter of 17 pages covers the modelling of thermal circuit expressing it by the notion of the electric circuit, referring to every way of heat transmission. Focal chapters of the book contain heat transfer by air movement and heat exchange by radiation. Starting from the Nüsselt theory, processes in laminar and turbulent flow are presented. Heat transfer through vertical and horizontal surfaces as well as natural convection between parallel surfaces are separately discussed. Based on the theory of Graaf and Held (1953), the ways to determination of the similarity numbers are presented at different angles of inclination, including also the results from other authors. In Chapter 6, 35 pages deal with the theoretical background of heat transfer by radiation on the basis of emissivity, absorptivity, and reflectivity of surfaces. The theoretical and calculation models detail the determination method of the radiation view factors, tabulating its results for sizing. In Chapter 7, a simulation model is presented for the heat exchange of a room. Chapter 8 covers the moisture balance in premises and the vapour diffusion through porous walls. The 47 pages of the latter two chapters contain especially useful information for professionals active in research and development. A separate chapter is dedicated to the effect of solar radiation on the thermal balance of a building. The characteristics of altitude and azimuth of the sun's orbit, i.e. the direction and intensity of solar radiation are summarised. Detailed description is given about the physical and mathematical model of solar incidence on single and double glazing. The gain by solar radiation for the heat demand of the building is discussed. The phenomenon of heat transfer is introduced by the author in the 115 pages of Chapters 10 through 14 by real theoretical exacting. Various numerical methods are applied to studying the non-stationary processes. These chapters are really delicate to professionals and researchers of the theory of heat transfer. Separate chapters are devoted to the discussion of periodical heat effects and to the evaluation of multilayer wall structures. The concluding Chapter of the book includes the non-stationary model of a room involving the effects of solar radiation and of different outer and inner walls. The book is complete with the list of notations and with a very detailed set of references (28 pages) at the end.

When publishing a new specialist book, the question arises: what kind of readership does it aim for? Turning the pages of the book, it is necessary to state that it contains very useful knowledge to researchers, developers, and designers interested mainly in heat transfer in building on theoretical level. It is certainly not misleading to declare that the book comprises especially interesting and useful "delicacies" for professionals teaching and researching the theory of heat transfer in the higher grades of education. Apprehension of the book needs thorough mathematical knowledge of differential equations, finite difference and finite element method.

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