Journal of Solar Energy Engineering

Book Review

Solar Building Architecture, by Bruce Anderson. 1990. 348 pages. Price: $50.00.

REVIEWED BY JOHN W. MITCHELL[1]

This book is one of the 12 volumes of a series summarizing the research, development, and implementation of thermal solar energy conversion technologies that were carried out under federal sponsorship during the last 11 years of the Solar Energy Program. Compiling the results of the research was motivated by concern that the results of research would be lost in an era of decreased national interest in renewable energies. The goal of the series is to provide a benchmark which serves as a starting point for the new researcher as well as a reference for the experienced worker.

Volume 9 covers the role of solar energy in architecture and planning. The subjects discussed are local and regional planning issues; collection, distribution, storage, and use of solar in buildings; and architectural integration of solar systems with the building. The volume is more of a guide to the technical field than a technical treatise. A good historical review of the developments in each chapter is provided which leads to a discussion of the major developments. Physical descriptions of the thermal processes involved are given in each chapter, and references point to the pertinent sources for detailed results. Useful conclusions and design guidelines are found in each chapter. The volume is easy to read, and fulfills the goal of bringing the reader up-to-date.

Chapter 1 discusses the history of DOE sponsored research in solar building architecture. Developments in this area were characterized by innovation and experimentation. The field brought together a variety of disciplines and a need to consider economic, architectural, and solar factors simultaneously. Those research issues necessary to produce good design are discussed thoroughly.

The issues in planning are summarized in Chapter 2. The dichotomy between the need to take a comprehensive and integrated approach versus the actual paths taken is discussed. Legislative and zoning attempts to provide solar access and development are covered. The references will provide a base for future attempts at planning.

Technical issues in the envelopes of buildings are covered in Chapter 3. A very good physical description of the collection of solar and the flows of heat through the walls, roof, and other elements in a building is given. Innovative approaches to the use of roofs and walls to maximize the solar benefit are discussed. This section provides a useful guide to what works and what is not successful. The chapter concludes with future research issues.

Chapter 4, thermal storage in building interiors, is the longest and most technical chapter. This is appropriate since this is also the most complex and least understood issue in buildings. An excellent physical description of the processes involved in storing and releasing energy from the building mass is given. The diurnal heat capacity is discussed, and useful tables provided. The chapter covers the transition from intuitive design to a quantitative approach.

The distribution of energy throughout the building interior is covered in Chapter 5. A physical description of the flows of air inside building provides a base for discussing various approaches. Projects both in entire buildings and test cells are covered, as well as experimental and analytical methods to determining air flows.

In Chapter 6, integration of the solar system with the building envelope is covered. This is mostly a descriptive chapter, and provides a historical perspective.

Chapter 7 covers the issues relating to integrating solar heating with nonresidential buildings. This is a challenging subject with issues different from those in the residential field. The commercial building designer faces major constraints on thermal and visual comfort, acoustics, air quality, safety, economics, control, and regulations. The references direct the reader to a detailed description of research performed on each issue.

Solar Resources, by Roland Hulstrom, ed. M.I.T. Press,Cambridge, Mass., 1989. 408 pages. Price: $45.00

REVIEWED BY JAN F. KREIDER[2]

Solar Resources is the second in a series of 12 books designed to summarize and archive research conducted by DOE in solar technologies.This book consists of eight chapters covering topics related to insolation data analysis, measurement, and use. Topics range from insolation networks, instruments, models, and applications for day-lighting design. The size and depth of the chapters varies significantly. For example, insolation measurement consumes more than 130 pages whereas the subject of the spectral nature of terrestrial radiation is discussed in only 25 pages. In spite of the uneveness of coverage, this book belongs in the library of any serious solar scientist or engineer whose work involves the use of solar radiation data beyond basic monthly average data.

Chapter 1 is an introduction to the book prepared by the editor. The second chapter (by R. Bahm) discusses insolation data bases in the U.S. Beginning with a definition of terms, this chapter covers the familiar SOLMET, TMY, WYEC, and SOLDAY along with several older, rarely used data bases. Lists of sites and the details of magnetic tape formats are

[1]Professor of Mechanical Engineering, University of Wisconsin-Madison, Madison, WI 53706. Assoc. Editor, JSEE.

[2]Joint Center for Energy Management, University of Colorado at Boulder, Boulder, CO 80309.