Book Review: Sun, Wind & Light: Architectural Design Strategies

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Publisher Wiley Chichester 2001
ISBN 0471348775

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Summary

Strategies are presented for building designers at the schematic stage of design, to guide them in principles and methods for designing sustainably.

Review

One of the best ways of learning for building designers, whether students or qualified practitioners, is to hone their skills through practice. This book concentrates on one important design skill, which is the ability to make buildings respond to the sun, wind and light. Its premise is that the more designers exercise this skill, the less energy their buildings will use, so the less carbon dioxide they will emit, and the greater will be their contribution to a sustainable future. This is the discipline known as bioclimatic, or passive, design, and its virtues are well recognised. Whilst it is an appealing route for many designers, the path from good intention to a working building is not obvious. Designers need practical guidance, particularly in the early stages of design before crucial decisions become fixed.

Sun, Wind and Light is a handbook of such guidance. There are many books offering advice on this subject, but few structure their advice as effectively as this for use as a working tool - in fact only one other comes to mind (Watson and Labs 1983).

The advice comes as a set of 84 discrete strategies for action, each presented succinctly in a few pages. Each strategy states a principle that might contribute to design thinking. For example, when considering the shape and enclosure of rooms, there are a number of possible strategies for cooling, of which one is 65: cross-ventilation. The principle is stated thus: "Cross-ventilation through rooms is increased by large openings on both windward and leeward sides."

This is one of the more obvious strategies, but that is not to say that the three pages devoted to it should be skipped. They explain how cross-ventilation works and what it implies for design, illustrate some techniques for improving air flow through rooms, include a rule-of-thumb chart for sizing the openings, and show examples from buildings by Paul Rudolph and by Christene Hauvette and Jérôme Nouel. There are cross-references to a number of related strategies that lend support.

That is typical of the approach. There is a welcome emphasis on consistency in the organisation and treatment of the strategies, which will be helpful to frequent users. The strategies all have a main statement of intent, a few pages of pertinent explanation, and copious, helpful illustrations. The text is consistently structured with judicious use of highlighting and summary, to make fast reference easier. All the illustrations have been elegantly drawn freehand in ink to a common style by the team of five illustrators. Almost all technical material is presented in graphical form, rather than as formulae, so that the book is packed with nomograms and charts for calculating a wide range of things that you might want to get a quick fix on during design.

The strategies are organised into groups relating to building elements that designers need to consider, from the scale of streets, down to the scale of windows, and sensibly labelled with page headers on the side of the book. One shortcoming is the absence of a more organised route from the early strategies on climatic analysis to the appropriate strategies for design found later. Users are reliant on the cross-referencing and the indexes, but these are both very good.

The writers are aware of current thinking in the field, and build on the work of others. Their sources are well cited if readers wish...
to follow them up in greater depth. In fact, sources of information throughout the book are referenced in a scholarly fashion. Seen as an index of case studies alone, the book is of great value, referring the reader to specific pages in sources of further information.

This second edition is a major revision of its predecessor, and enthusiasts of that edition should consider replacing it. There are over twice as many pages, approaching twice as many strategies, and many more graphic aids. The new edition is now considerably less US-centric, presenting strategies and graphic techniques for most inhabited latitudes both sides of the equator, and giving data in metric as well as imperial units.

However, some of the graphic techniques require additional climatic data presented in suitable formats in an Appendix, and this covers only the United States. A European user would be advised to collect and adapt a similar set - instructions are given. Apart from the occasional lapse (e.g. in strategies 60 to 63, and 93 on sizing solar collectors) all the techniques would then be useable.

The insistence on presenting technical material only in graphical form is due, no doubt, to the traditional reluctance of architects to work with numbers. But often the graphs represent a simple formula, and this has not been given in the text. Some users may prefer the flexibility offered by a formula, which can be remembered for use without the book, and fed into spreadsheets for repeated application.

How good is the advice? The principles are sound and cover a fairly comprehensive range of situations. The more detailed advice on sizing elements is intended as a first stab, to help shape the design in the formative stages. Once a rounded proposal is available, it can be subjected to more rigorous appraisal using advanced computer tools. So it is not precision that is required so much as a well-judged push in the right direction. The hand-drawn graphic tools would seem to provide this.

Some of them really do seem to give help, not easily available before, on such matters as estimating daylight factors for borrowed light (strategy 54), sizing wind catchers (67), and sizing earth-air heat exchangers (109). Others turn out on closer examination to be graphical equivalents of more trivial calculations, such as estimating buffer space temperature (56), sizing walls and floors for ground contact cooling (72), or estimating duct sizes (107). And in some cases there are better simple formulae that could be used, as in sizing windows for daylight (94).

One hopes that a book as comprehensive and useful as this will guide the initial design of many a significant building in the future. It becomes important, therefore, that the guidance it gives is reliable (the literature elsewhere contains occasional errors that have been copied from text to text without correction).

There are not many obvious inaccuracies. The expression in strategy 82 for adjusting daylight factors to take into account reflected light can be seen to be suspect (dividing by (1-a) would make more sense than multiplying by (1+a)). Graphically, there is a puzzle about the graph in strategy 70, which sizes atria with respect to required daylight factor in adjacent rooms for a range of window:wall percentages from 50 to 0. How does one interpret the limiting curve for 0% glazing, or even low percentages close to it?

The thoroughness with which the book has been presented suggests that the material is reliable, but any less obvious inaccuracies that might lurk would easily evade detection. Although references to external sources are good, the derivation of original work in the book is less well treated. This is particularly irksome with the graphic aids. An additional appendix going into the theory behind some of them would be very helpful. As formulae are not given, and many of the aids are in the form of nomograms (entering a nomogram is like entering a black box), it is difficult to judge how reliable they are.

Otherwise, most of the noticeable errors are connected with captioning the graphs. The caption errors in the graphs used in strategies 28, 30, 32, 54, and 69 are not likely to be misleading, but correcting the captions in strategies 68 and 107 calls for some careful thought.

The authors are interested in the close relationship between architectural form and the flow of energy in buildings, and have provided designers with a working tool for exploiting that relationship. It is not just about saving energy. The authors hope that revealing this relationship to a building's occupants will be beneficial to their health and well-being. They make an eloquent argument for passive living.

Some designers may find the concept of this book old-fashioned, now that computer analysis is becoming easier and more accessible to designers. However, most environmental computer programs will only analyse a building's performance after it has been designed. There are very few that are of real help in concept design. One of the authors of this book (Brown) is also co-author of the program Energy Scheming (Brown, G., Sekiguchi, T. and Kline, J. 2002), which claims to be unique in allowing design with energy in mind right from the beginning, with graphical input from drawings. Another example of such a program is EcoTect (Square One 2001).
Designers may well prefer working in this way, discovering the principles for themselves. There will still be those that find the material in this book invaluable in making formative decisions about their designs, and at the same time guiding their understanding of environmental processes. For these designers, this is quite probably the best practical companion to bioclimatic design available. No architect should neglect to follow the advice that it gives.

References


About the Reviewer

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