Executive Summary

This source book gives a comprehensive overview of innovative daylighting systems, the performance parameters by which they are judged, and an evaluation of their energy savings potential and user acceptance. The book has been written to overcome a lack of evidence of the advantages of daylighting in buildings and a lack of knowledge regarding the performance of innovative daylighting systems in buildings in various climatic zones around the world. The information presented here is intended to be used in the earliest stages of the building design process.

Innovative daylighting systems are designed to redirect sunlight or skylight to areas where it is required, without glare. These systems use optical devices that initiate reflection, refraction, and/or use the total internal reflection of sunlight and skylight. Advanced daylighting systems can be designed to actively track the sun or passively control the direction of sunlight and skylight. The systems included in this book have been generally limited to passive devices.

This book describes in detail the wide range of innovative daylighting systems available worldwide today, including information on their components, principles on which they are based, applications for which they are appropriate, production, control, costs and energy savings, maintenance, examples of use, and performance assessments.

The performance assessment results were obtained by monitoring the system using physical models under sky simulators, or full-scale test rooms or actual buildings under real sky conditions. The types of innovative systems selected for testing are currently available in the marketplace or have been recently developed in laboratories. The results summarized here demonstrate that, if selected according to daylight climate and integrated appropriately with electric lighting and shading controls, the majority of these systems can enhance daylight in building interiors and thereby promote energy savings. It should be noted, however, that performance in actual buildings will differ from test room results.

Daylighting strategies are seldom considered in the earliest stages of a building design. This is, in part, a result of the absence of simple tools that can predict the performance of advanced daylighting strategies. This source book provides information on simple design tools that can predict performance and can be used by non-experts. The book also includes an introduction to the appropriate use of shading and electric lighting controls in order to promote energy savings.

Barriers to the use of advanced daylighting systems still exist, particularly in the transition from research to building practice. There is much to do in research and development as well as in practical application. Two key areas that need further research are the human dimension of the daylighting equation and the integration of daylighting systems in buildings to arrive at low energy solutions that meet human needs. New research in these two areas will be carried out under the auspices of Task 31 (see http://www.iea-shc.org). Nonetheless, the information presented in this book demonstrates that the use of advanced daylighting technologies can close the gap between potential benefits and actual achievements in building practice.