

Preface

APPROACH

The fundamental goal of this text is to present information about environmental controls to use during the early design phases of building creation. Our expectation is that if suitable information about environmental controls can be incorporated during the phases of programming and schematic designing, better buildings and a more efficient design process will result. Consequently, we offer guidelines and approximations that can advise the designer, encouraging her or him to consider and to make early accommodations for environmental controls. We also believe that if these guidelines and approximations are used in schematic designing, then the proposed solutions can readily be “fine tuned” during subsequent design phases.

ORGANIZATION

The text is divided into two parts: the first discusses passive environmental controls, and the second describes active environmental control systems. The environments noted throughout this text include those within buildings as well as those immediately adjacent to building exteriors. Integration of various passive and active environmental controls in buildings will better insure that occupants can live and work comfortably.

PASSIVE ENVIRONMENTAL CONTROLS

The first part of the text—the discussion of passive environmental controls—focuses on the passive management of the thermal, luminous, and acoustic properties of the built environment. The discussion is organized into three *four-chapter units*. Each of these units contain, in order, a *first* chapter that describes the physical principles that characterize heat, light, and sound in natural and built environments; a *second* chapter that identifies the sensory system in the human body that responds to the physical stimulus of heat, light, or sound; a *third* chapter that delineates the properties (or manifestations) of heat, light, or sound, as they appear in the natural (and built) environment(s); and, finally, a *fourth* chapter that catalogs numbers of guidelines—based on the application of passive environmental controls—suggesting how buildings (and adjacent external spaces) can be created to support the sensory needs of occupants.

The *first* chapters of these three units describe heat, light, and sound (i.e., in terms of energy form) and show how each behaves physically. Also, in these first chapters, we have briefly identified how these energy forms are measured. In addition, we explain the unit systems that are applied to characterize the energy forms.

The *second* chapters of the three units describe how the particular human sensory system responds to the physical stimulus (of heat, light, or sound). The discussions of physiology focus particularly on how the information from the physical world is taken in and interpreted by the appropriate sensory system. Then, in these second chapters, we have identified the magnitudes of interpretable physical stimuli and the ranges of these magnitudes that occupants would find comfortable to live and work in.

The *third* chapters of the three four-chapter units describe attributes of the natural and built environments that stimulate our sensory systems. Indeed, these attributes may enable our living, work, and play, or they may exist as challenges to our existence. Subjects addressed in these third chapters include weather and climate, daylight availability, and noise presence. A goal of this text is to encourage the reader to compare the ranges of human sensitivities—to heat, light, and sound—to characteristics of the natural and built environments, thus forcing consideration of the ways in which we are challenged by these environments and how we can respond.

The *fourth* chapters in each of these units identify passive control recommendations whose applications in and around buildings can enhance occupants' living, work, and play. These recommendations, or guidelines, include (a) strategies for siting buildings and using site conditions like vegetation, topography, microclimate, and the presence or absence of adjacent buildings or other built forms; (b) ideas about the internal organizations of buildings such as horizontal and vertical layouts; (c) bases for selecting building envelope compositions (i.e., whether to exclude negative qualities or to introduce positive aspects of the external environment); and (d) suggestions about what internal finishes, furnishings, space divisions, and other like features to apply to achieve satisfactory environmental control.

ACTIVE ENVIRONMENTAL CONTROLS

The second part of the text—six chapters about active environmental controls—discusses HVAC systems (to provide heating, ventilating, and air-conditioning in buildings), electrical systems (to convey electrical energy and operate communication systems in buildings), plumbing systems (to supply water and carry out liquid-borne wastes), fire safety systems and design issues, and human conveyance systems (to move people through buildings). This section describes what these systems do, how they operate, what their primary components are, where these components are commonly placed in buildings, how large the components are, how large the spaces used to house the components need to be, and how the components and spaces may be integrated into building designs. Various rules-of-thumb, design strategies, and other planning short-cuts are also suggested for applications in the early stages of the architectural design process.

Overall, this textbook is the result of collaboration between an author and four graphic artists, all from the University of Washington. My background is in building engineering. Three of the four artists are architects; the fourth is a medical illustrator. I have identified the contents addressed in the text and have suggested—in very approximate manners—the composition of the drawn materials. The four artists have taken these suggestions and have created the artwork that appears throughout the text. So, in the end, this text is the result of the teamwork of five individuals.

DEAN HEERWAGEN
University of Washington, Seattle