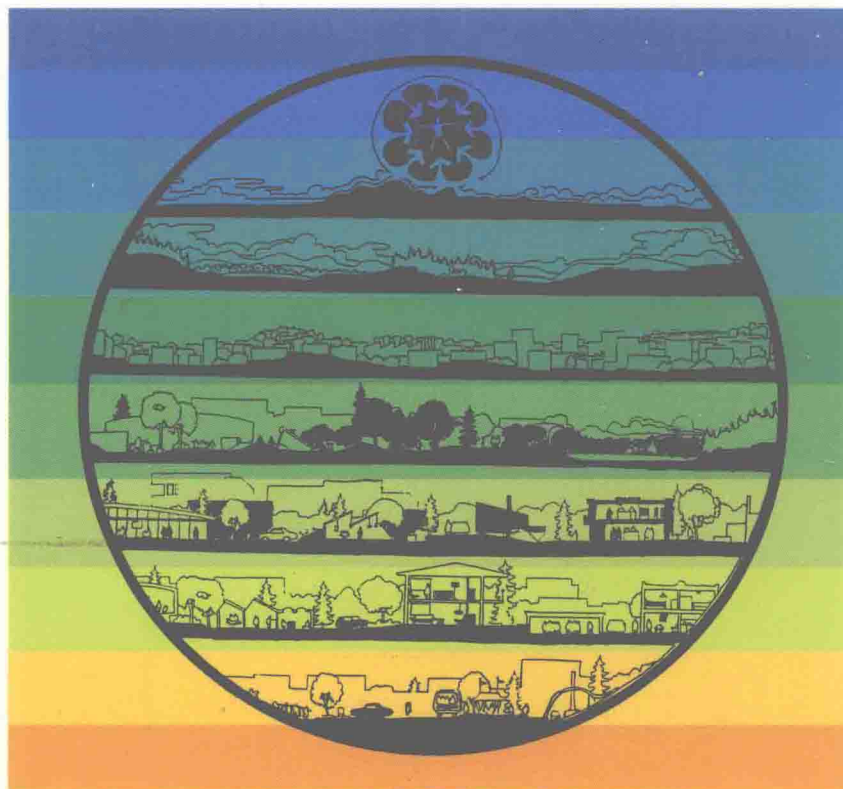


THE BUILT ENVIRONMENT

A CREATIVE INQUIRY INTO DESIGN & PLANNING

EARTH
REGIONS
CITIES
LANDSCAPES
STRUCTURES
INTERIORS
PRODUCTS



A COLLABORATIVE WORK

Tom J. Bartuska & Gerald L. Young, EDITORS

THE BUILT ENVIRONMENT

Creative Inquiry Into Design and Planning

Tom J. Bartuska
Gerald L. Young

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Preface

The “built environment” is a challenging subject. It is pervasive and relevant to all that live in the human-made or arranged world—to all who live on this planet. A healthy built environment makes significant contributions to human life—it fulfills human needs and values, extends and increases comfort and enjoyment. A quality environment can foster a sense of involvement and pride. An environment created without supportive qualities can have a very negative effect on people, causing decreased abilities to learn and perform work. An unhealthy built environment breeds high levels of apathy, crime, vandalism and mental disease. The character and quality of the built environment is dependent on everyone. It is important for all members to be aware, involved and responsible. All of us are an influential part of the on-going story of the built environment.

The use of the term “built environment” is relatively new, but has become increasingly more accepted in contemporary society. In reality, the built environment is as old as the beginning of time, dating back to when humans first fashioned stone tools, created fire for warmth, and modified caves for shelter. The term embodies all human creation.

The primary purpose of this book is to explore and clarify the many interrelated aspects of the built environment and to recognize that design (and other) problems overlap many fields of interest and study. This need to integrate across traditional specialized boundaries is expressed not only in student and faculty interest, but also in professional and societal concerns found in contemporary literature and mandated by state and federal policies. This work is dedicated to the elimination of apathy and, conversely, is intended to encourage people to become aware and involved in

the life supportive qualities of the built environment. Awareness and involvement are important prerequisites for all responsible citizens. The book attempts to develop an interdisciplinary forum for collaborative study of the built environment. It encourages involvement from people of all disciplines to enter into study of the built world in which we all live, work and play. It demonstrates the importance of collaborative effort in dealing with complex subjects in a unified and holistic framework.

The genesis of this particular collaborative investigation began at Washington State University in 1973. A graduate-level, special topics course in Environmental Science was first offered in 1974 to explore and develop the related interdisciplinary aspects of the built environment. The course met with considerable enthusiasm from a diverse group of students and faculty. This effort evolved into the development of another experimental and temporary course for undergraduate students in 1977. The same positive results occurred and in 1979 the course achieved permanent status as an interdisciplinary, team-taught course in Architecture/Interior Design/Landscape Architecture. In 1984, it was approved as a class which fulfills General University Requirements for graduation.

Early on, our collaborative group carried out an exhaustive search for appropriate books for this new study. We determined that libraries were full of definitive references on each component of the built environment, but few addressed the important overlapping aspects of the humanly created world. None existed which were appropriate in scope and integrative enough in concept to be useful to our work. Consequently, we decided to create this integrative

inquiry into the design and planning of the built environment. The extensive work of all participating authors, their integrative chapters and their searches through the literature to find the best resources are deeply appreciated and have made a significant contribution to this on-going work.

We, the editors, would like to personally express our sincere appreciation to the many past participants, who have collaborated to evolve the book into its present form. The editors, Gerald Young and Tom Bartuska are the only remaining participants from the 1973 initiating endeavor. The collaboration between Ecology (Environmental Science) and environmental design has been an important interdisciplinary thread with a unifying influence on this work. A challenging, but compatible, relationship exists between Environmental Science, which deals primarily with the “Natural” but human impacted environment, and this study, which focuses on the “Built” or human created world.

A special thanks is extended to the years of “202” students—who have provided constant feedback through their interest and encouragement, and their concerns and complaints—challenging us to do a better job.

The hidden, but extensive work of Sandra Tyacke, Sharon Ledeman, and Phyllis Klapwyk needs recognition. They, with others, have been most helpful in typing and retyping a seemingly endless array of written drafts, outlines, references, letters and memos. Sandra Tyacke’s remarkable patience and word processing skills have made this whole process run smoothly. We would also like to acknowledge Noel Moffett, Catherine Bicknell and Sarah Recken for their graphics and format design. Helen Bartuska and Bev Young have both patiently seen this volume through many drafts—and many hours and days “away.” We thank them for that patience and for so many years of caring and help.

The graphics and illustrations are the responsibility of the authors of each chapter, unless otherwise noted. David Lim, Peter Wolfe, Karl Heitman, Janet Archer and Zulqaisar Hamidin, students of Architecture at Washington State University, have developed many of the diagrams and sketches. Their work is noted by their initials.

To all above contributors, we are deeply thankful.

Tom J. Bartuska and Gerald L. Young, Co-Editors,
Washington State University

Introduction

Ian McHarg

Environments which bear no visible human marks are rare—the realms of ocean, the poles, deserts, mountain summits. There, human works are absent, but nonetheless, these environments have all relinquished the magic qualities of the term primeval. That most pervasive sphere, the envelope of gases that protects and sustains us, is now disturbed, tainted, and has corrupted the innocence of the last natural refugia.

The world is now the human created environment—a built environment.

As long as humans were puny in an implacable, all powerful nature, their works mattered little. They were only another predator limited by their prey, their works trivial, ephemeral incidents in the biosphere. Today, human works have global effect, often accomplished without thought or knowledge. It would be reasonable to assume them to be random, some harmful, some neutral, others beneficial, but not so, they seem to be selectively destructive. Who would have imagined global effects from aerosols, abandoned refrigerators? Who would have assumed that human acts could cause serious transformations to world climate, induced warming, sea level rise, disruption of the protective ozone layer? Can the mind adjust to the transformation of benign rain into a toxin threatening forests in North America and Europe?

Humans have, knowingly or not, accumulated powers to control and modify the environment, and, at last come to the realization that our impact is destructive to ourselves and to the systems upon which we depend. We have no recourse but to come to understand the way the world works and initiate behavior which will maintain the biosphere, enhance human health and well being. The built environment

must reflect the intelligence of humans, not their ignorance—a belated conclusion, not widely understood, it awaits application and realization.

The view of the earth from the moon was a profound transformation. After centuries of observing the lunar procession from earth, the subject and object were reversed and we looked from moon to earth to perceive the lonely orb, the earth our home, blue-green from oceans, maritime algae, and terrestrial vegetation. The astronauts view this green layer, this celestial fruit and observe blemishes and lesions pocking the tissue. They and we must ask, are humans but a planetary disease? The answer is blunt, there is disease upon the earth, the lesions are the works of human beings. There are humans and institutions whose fulfillment involves the continuous infliction of disease and death on the world life body. It is intolerable.

Yet, can we possibly contemplate the role of world steward, understanding the operation of this vast system, planning human affairs in such a way as to perpetuate and enrich the biosphere including the human created built environment?

We can take heart from the realization of the past accomplishments and the current operations of simpler organisms. It is now widely accepted that the atmosphere, oceans and lands are the creation of life. The transformation of the lethal primeval atmosphere into the benign envelope that encompasses us was the work of simple microorganisms. Its regulation is largely their work today. It is believed that the evolution of the oceans, their salinity, temperature, pH, are a product of life. Without doubt, microorganisms, plants, later animals, colonized the earth, producing soils, modifying climate, the hydrologic

cycle, creating habitats, successively making environments more fit for life.

There is one further analogue to give heart. One simple animal has accomplished greater environmental transformations, uniformly benign, than the sum of all human works in all of human time. The coral polyp with its photosynthetic associates, has transformed vast oceanic deserts, incorporating calcium carbonate and silicate into their beings to create among the richest environments of the world, habitat for incredibly diverse and stable ecosystems.

So, modifying environments is not unnatural. Indeed, it seems to be critical to evolution. Nor were these transformations trivial. So we can accept that modifying the environment and creating a built environment to accommodate human life is perfectly natural and appropriate. But, there is a caveat. The transformations described enhanced the environment for its inhabitants. But there were and will be costs and benefits.

So we can assume that people have reason to undertake the role of consciously manipulating the environment, to make it more fitting for all life, including humans. We have already demonstrated that we can dispose great powers of destruction, why not reverse this power for better creation?

Darwin stated that the surviving organism is fit for the environment. Lawrence J. Henderson augmented this proposition. The world includes a multiplicity of organisms and environments. It is necessary for all organisms to find the fittest available environment, adapt it, and oneself to accomplish better fitness. Implied, but not explicit, was the definition of a fit environment as one in which the consumer found the maximum requirements on any given site, where the least work of adaptation need be undertaken.

In the beginnings of the century, Henderson observed that the oceans exhibited self regulation and thus a responsiveness, a term usually reserved for life. In 1969, moved by Henderson's arguments on "The Fitness of the Environment," I wrote that if Henderson's description of organic fitted the oceans, why not then the atmosphere.

This inquiry was developed brilliantly by the English chemist, James Lovelock, who advanced the Gaia Hypothesis, which, simply stated, suggested that we best consider the earth, its inert and living systems, as a single superorganism. As humans are comprised of many organs, tissues, billions of cells, and include water, sundry gases, calcium, acting as a single integrated organism, so too the earth, rocks,

oceans, soils, microorganisms, plants, animals seem to interact coherently as a unitary system.

Lovelock then investigated the matter of the regulating system—did this require a god-like creator? His conclusions were to the contrary, thermostatic devices widely used by living systems would be perfectly adequate. To establish this point, Lovelock invented Daisyworld with light and dark flowers, higher and lower reflectance. Preponderance of the former reduced temperature, the latter increased it. If each has a selective temperature range, increasing or decreasing in numbers would create a natural thermostatic device which would regulate temperatures.

Evidence to support the hypothesis is only preliminary but quite positive, and certainly provocative. I can imagine no greater challenge to science than to investigate the Gaia Hypothesis. Should it be proven conclusively the results could be dramatic. The most immediate would be the necessity for a holistic view and the relegation of reductionism to contributor rather than final product. All parts must be seen as agents in the whole. I suspect that economics would be the next arena of change. If the Gaia Hypothesis is true, and the bulk of the world's work in regulating atmosphere, oceans, temperature and terrestrial ecosystems is performed by microorganisms it becomes necessary to identify them, their roles and to give them value. Perversely, natural areas may well assume inordinate value, highly urbanized areas may well incur significant global costs.

Philosophy and theology would also be subject to revision. How many prayers have been issued from people asking for interventions, prevention of flood, drought, earthquakes, volcanos, hurricanes, pestilence, pleas for good harvests of livestock, game, grains, and fish. What effect they have had we will never know. What change will occur when it becomes clear that many of these matters have been and are regulated by Gaia? Apparently, the rapid increase of carbon dioxide by humans may not only induce world warming, but also exacerbate violent climatic, hydrological and terrestrial events. We are bringing violence upon ourselves. Can we reduce it? So the agents who could respond to prayers will be creatures and processes among us. How do we view these powerful god-like creatures, how do we negotiate, collaborate? We may remain ignorant of cosmic God but encounter a more modest planetary god. This requires a new stewardship—a new theology and philosophy advancing sustainability. Clearly, biology will be affected, no longer plants and animals

categorized into taxonomic lists, even ecosystems or biosphere are too limiting. The Gaia hypothesis integrates inert and living systems into a biological whole. The challenge to biology is not traditional geochemical cycles but the geobiological processes which comprise Gaia.

In my own realm of planning and design—that which leads directly to a human created built environment—a transformation is necessary. Given a world system with elaborate self-regulating processes, the human role is first to understand these and thereafter engage in conscious modifications for human use which are not destructive of the critical processes. We must evaluate our creations in terms of their contribution to world processes which must be maintained. These environments can then be evaluated to ascertain their tolerance or intolerance to prospective modification. Planning and design must then include responses to global and regional contributions to Gaia, be responsive and expressive to world, region, place and people.

This brings us back to the astronauts' view of the earth, a blue-green celestial fruit on which lesions are visible. The fundamental role for humanity is to contribute to the health of the planet, the earth, our home, to heal disease, to engage in modifications to enhance the global environment, among which none may be more important than the built environment.

Until the advent of the Industrial Revolution the built environment world wide instituted small scale and local interventions into the natural environment of little damage to world ecology. Since then the scale has changed dramatically. Megacities including Calcutta, San Paolo, Mexico City exceed all world urbanism prior to the 19th century. The human capability of environmental transformations has moved from little consequence to global threat.

While the prospect is frightening, history is reassuring. For most of human history, modifying the environment, including city building, has been appropriate to natural systems, responsive in materials and forms, of limited scale, and generally humane. One should not overlook epidemics, floods, earthquakes or oppression, slavery, feudalism, war, but these events are not necessarily a direct consequence of built form. It appears that there are human and technological factors which are identified with successful societal accomplishments. There have been vernacular adaptations in the built environment which are exemplary. In addition there has developed an extensive body of knowledge on the environment which is fundamental to human health and understanding that permits planning and design based upon objective principles—it is challenges such as these that are addressed in this book on the built environment.

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PART I

Definition, Design and Development of the Built Environment

The Built Environment: Definition and Scope

Tom J. Bartuska and Gerald L. Young

We all build. We design and build our lives from one experience to another. In a similar way, components of the built environment are created from human needs, thoughts and actions. Sometimes, the substance of human action is grand, and we build quality life experiences for ourselves and others. Other times, human actions are short-sighted, creating uncomfortable situations that are less fit for healthy human activities.

There are as many reasons to design and build as there are objects constructed. Each aspect of the built environment is constructed to fulfill human purpose. Where you are sitting reading this page, you are surrounded by hundreds of constructed objects. These are all contributing components of your “built environment.” The words on this page, this book, your chair or desk, the nearby stereo, the phone that connects you to many others throughout the world, even the walls, floor and ceiling of the space that forms your enclosure, are humanly made or arranged, and therefore part of the built environment. Look further afield and observe the environment out of the windows. The buildings, automobiles, roads, bridges, your landscaped garden or yard, and the surrounding city are also part of a human-made or arranged built environment. The environments beyond the city, the parcels of agricultural land, the highways and other transport and utility systems, can also be included. Even state, national, and global organizations are created by people and are an important part of this extensive built environment.

The components of the artificially created world surround us in abundance. It might be harder to find environments that are “natural”—not made or arranged, maintained or controlled by people or

society. The sky, weather, free-flowing rivers and streams, wilderness areas seem, for the most part, not “built,” but “natural.” But, even these are not totally free from human intervention and pollution.

The accumulative results of the changes people have made on the environment are extensive. A large percentage of humanity lives in urban metropolitan areas. These massive urban and suburban developments are the largest, most complex human systems ever created. Equally extensive are the modifications that have occurred in the rural areas of the world: farmlands, domestication of animals, forest and wildlife management programs, damming of major rivers for power, navigation, and flood control.

The built environment fills every nook and cranny of your everyday world. It strongly influences human lifestyles and those lifestyles influence it.

In the most basic sense, people first constructed tools, fire and shelter to survive in the wilderness. Once survival needs were satisfied, people continued to mediate the environment to make life safer, more comfortable and productive.

Although times have changed and populations have grown, the basic reasons for creating a built environment remain essentially the same. We construct tools and products, modify and manipulate space, build structures and cities, and manage regions to make life safe and comfortable, more enjoyable and productive for ourselves as well as for future generations.

When studying interrelated aspects of the built environment we must ask ourselves important questions. Humans have made extensive changes in the environment to satisfy needs and wants, but how often do we consider the consequences of these



1. The built environment: A pervasive and evasive, double-exposure of a city—Chicago, Illinois.

actions—especially the total and long-term consequences? Do we take an equally extensive responsibility for the actions or changes involved? Are we concerned about the overall effect these actions have upon neighbors or upon the earth, its finite resources and delicate ecological systems?

The primary purpose of this book is to develop an understanding of the things we build, how they are created and how they affect human lives. Through an increased involvement and awareness of the design of the built environment, more of those designs may influence our lives in a positive, contributing way. Quality tends to encourage more quality, more personal enjoyment, enrichment and involvement. Poor quality creates apathy and has negative impacts on human health and well-being. Personal interest, sensitivity and understanding are needed to fully appreciate its positive and negative characteristics.

Since the built environment is manifested in physical things, it is relatively easy to observe and study. It is critical for the reader to participate, to visualize and to experience real environments. This involvement can easily be achieved by experiencing

and analyzing the many examples that exist in your local environment, home and community, as well as throughout the surrounding region, country and world. The text will encourage your participation and try to increase your interest, sensitivity and ability to analyze various aspects of the built environment. Get involved! Your active participation is necessary and will increase your learning experience, enjoyment and success.

A working knowledge of the built environment is vital for all responsible citizens. Such knowledge allows a citizen—the reader of this book—to be aware of and search out positive aspects of the built environment. Better understanding enables citizens to be more effective in taking corrective measures to eliminate or change the negative aspects. The best environments are created when we all work together in a cooperative way. All the pieces of the built puzzle are better if they are designed to fit together. We all insist upon quality in individual private environments, yet we tend to fall short of collectively insisting on comparable quality in the public realm. Individual and collective actions will greatly affect our lives and the lives of our children (and their

children). It is urgent to realize that we are all interdependent participants in the building process; we all can effect positive change. Citizens and politicians, bankers and lawyers, engineers and planners, scientists and humanists are all indispensable and influential parts in the design and management of a quality environment for all.

DEFINITION AND SCOPE OF THE BUILT ENVIRONMENT

In order to become effective in our pursuit of knowledge, we need to first establish the essential elements of a working definition of this evasive and pervasive term—"The Built Environment." In its simplest terms, the built environment is defined by the following four interrelated characteristics: First, it is extensive; it is everywhere; it provides the context for all human endeavors. More specifically, it is everything humanly created, modified or constructed; humanly made, arranged or maintained. Second, it is developed to fulfill human purpose—to satisfy human needs, wants and values. Third, it is developed to protect us from the overall environment, to mediate or change this environment for our comfort and well being. Last, an obvious but often forgotten characteristic is that human actions affect their surroundings; changes in turn change the context, and either contribute to or impact the environmental setting or context.

The simple, but inclusive, diagram below is intended to help visualize and define the built environment and describe the interrelationships of these characteristics:



The Built Environment



The Built Environment is everything humanly made, arranged or maintained;



to fulfill human purpose (needs, wants and values);



to mediate the overall environment;



with results that affect the environmental context.

The built environment has been commonly referred to as the man-made and woman-arranged environment (or vice versa). Although these terms are used in past literature, the authors of this book attempt to use inclusive language (gender-neutral terms), asserting the obvious, that both men and women have made substantial contributions to the creative process. The term "Built Environment" is considered more inclusive, and it is becoming a more accepted term in contemporary literature.

COMPONENTS OF THE BUILT ENVIRONMENT

Understanding of any subject is increased if it can be subdivided and organized into its related parts. To aid comprehension of the variety and scope of the built environment, its diverse content needs to be organized into component parts. The sum of all the interrelated components defines the "scope" of the total built environment. The components selected for this investigation are listed and described below.

1. Products



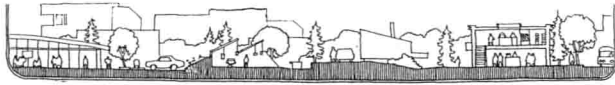
Materials and products; generally created to extend human capacity to perform specific tasks: tools (pen and pencil, hammer and saw, peace pipe or weapon); graphic symbols (signs; letters form words, then sentences combine into books); materials (bricks and mortar, wood, concrete and steel, etc.); machines (radios and stereos, televisions and telecommunication systems, calculators and computers, combs and hair dryers, roller skates and automobiles, buses and spaceships, etc.).

2. Interiors



A space defined by an arranged grouping of products and within the walls of a structure; generally created to enhance activities and mediate external factors (living room, work rooms, private rooms, public assembly halls, stadiums, etc.).

3. Structures



A planned grouping of spaces defined by and constructed of products; generally combining related activities into composite structures (housing, schools, office buildings, churches, factories, etc.; highways, tunnels, bridges, dams, etc.). Generally, structures have a dual internal space and external form characteristic.

4. Landscapes



Exterior spaces and/or settings for planned groupings of structures and spaces (courtyards, malls, parks; landscapes, sites for homes or other structures; farms, countryside, national forests, etc.). Landscapes generally combine both natural and built environments.

5. Cities



Grouping of structures and landscapes of varying sizes and complexities; generally clustered together to define a community for economic, social, cultural and/or environmental reasons (subdivisions, neighborhoods, villages or towns and cities of varying sizes, etc.).

6. Regions



Groupings of cities and landscapes of various sizes and complexities; generally defined by common political, social, economic and/or environmental characteristics (the surrounding region of a city, a county or multicounty area, a state or multistate area, a country, continent, etc.).

7. Earth

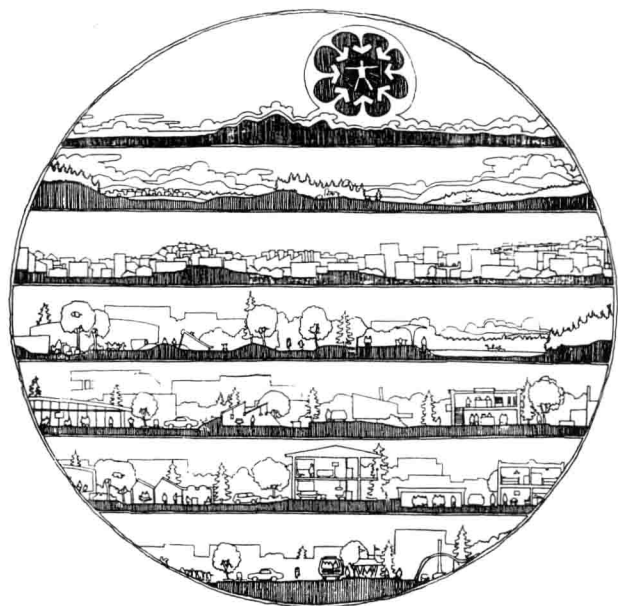


All of the above, the groupings of regions consisting of cities, landscapes, etc.—our beautiful planet earth.

These components can be better understood as connected “layers” or “levels” of varying scales interwoven together to form the built environment. This layering concept is illustrated in the following diagram or logo.

These layers or components provide the organizing categories for this book. They will be expanded upon and illustrated in the seven component sections (see Table of Contents). The listing and description of the seven components illustrate a significant overall theme—the interrelationships of each component to each of the others. The content of each component is made from a combination of smaller components. In turn, each component is a part of more complex components. This content-component-context hierarchy is the tool used in this book for organizing and studying the parts and wholes of complex subjects—the complexity and interrelatedness of the built environment.

The interrelationships are also an important aspect to the formulation of the built environment and require a great deal of understanding, forethought and planning. In our age of specialization, we have lost sight of the interrelationships among the components of the built environment as well as among people who participate in the building processes. More times than not, product designers only talk to their own colleagues, engineers only talk to engineers, planners only talk to planners,



2. The layers of the built environment. (“The Built Environment,” composite symbol design by S. Recken; linear graphic formats by J. Singleton).