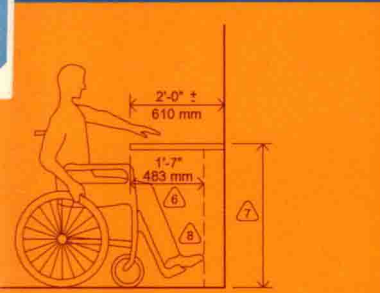


BASIC SKILLS



Residential Interior Design

A GUIDE TO PLANNING SPACES

Second Edition

Maureen Mitton
Courtney Nystuen

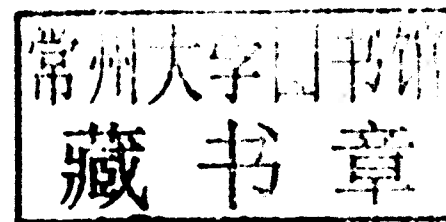
RESIDENTIAL INTERIOR DESIGN

A GUIDE TO PLANNING SPACES

SECOND EDITION

Maureen Mitton, CID, IDEC
Courtney Nystuen, AIA Emeritus

With CAD Illustrations by Melissa Brewer,
Shelley Pecha, and Jamey Bowe



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RESIDENTIAL INTERIOR DESIGN

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Having worked in the design portion of the construction industry for many years, I am well aware of the collaborative nature of the entire industry. Throughout the duration of every project (conception to occupancy), everyone needs to rely on the competence of those whose work precedes one's own. Short of that, it all starts to fall apart.

The other component of a successful project is an owner/client who clearly communicates his or her needs, collaborates on a vision of what could be, and is willing to take some calculated risks. I have had some outstanding clients over the years; I will not compromise their privacy by listing names, but those clients all have my ongoing respect and gratitude.

There is a list as long as my arm of people I have worked with and learned from over the years. You know who you are; you have made a de facto contribution to this book and you are greatly appreciated.

And, of course, the prime contributor was, is, and ever shall be Maureen Mitton; absent her vision, and tenacity, you would be looking at the palms of your hands.

Finally, I wish to acknowledge my first (and last) wife, Jean, and our grandchildren, who will be part of the next generation of designers; Kala, Macy, Hanna, Kaden, Ellie, and Sophie, you will have to work harder than I did . . . but, you can do it!

COURTNEY W. NYSTUEN
APRIL 2011

It was important to me to work on this project with Courtney. He taught this subject matter (and much more) for years and educated so many design students during his academic tenure; I simply had to find a way to keep him connected with students. He has also kept a full range of professional architectural projects going throughout his academic career and into his alleged retirement.

Courtney's ability to consider the information and content most useful to students and present it in an approachable manner made this book happen. Working with Courtney has been delightful. How he puts up with me will forever remain a mystery.

When we took a look at all of the CAD files that were part of the first edition, I was amazed by the excellent work done initially by Melissa Brewer. Her work on the first edition was meticulous, clear, and well organized. While Melissa had to move on after doing some work on Chapters 3 and 5 of this edition, she continues to be a major contributor to this project.

Shelley Pecha stepped in to do significant drawing revisions and new CAD work for this edition. With her super-organizational skills and lightning-fast CAD work (and an ability to deal with my lack of both of those things), Shelley made this project arrive on time and in great shape visually.

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My family, as usual, paid the price on this project. Thank you, Roger, Anna, and Luc, for putting up with my many weeks of plunking away on my keyboard, with my headphones on, and for being patient with all of the times I said I was too busy to do something fun.

MAUREEN MITTON
APRIL 2011

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INTRODUCTION

Every cubic inch of space is a miracle.

WALT WHITMAN, *Leaves of Grass*, "Miracles"

WHAT THIS BOOK IS ABOUT

This book is meant to serve as a primer on space planning for rooms and spaces in a home and to offer related information regarding codes, mechanical and electrical systems, and a variety of additional factors that impact each type of room or space. In addition, this book includes information about accessible design in each chapter in order to provide a cohesive view of residential accessibility. This new edition includes updated information on the International Residential Code and sustainability as well as other updates.

Intended as a reference for use in the design process, this book is meant as an aid in teaching and understanding the planning of residential spaces. Most chapters follow a similar format, starting with an overview of the particular room or space and related issues of accessibility, followed by information about room-specific furnishings and appliances. Chapters continue with information about

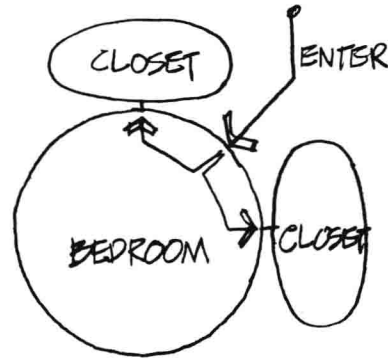
sizes and clearances, organizational flow, related codes and constraints, and issues regarding electrical, mechanical, plumbing, and basic lighting.

This book is meant to clarify minimum requirements for specific spaces and rooms to aid students and designers in understanding the amount of space that is minimally necessary in order for rooms to function usefully. Examples of larger spaces are also given, but at its heart, this book is intended to show students how to use space wisely and make good use of space throughout the dwelling. *With clear knowledge about minimums, designers and students of design can learn when it is appropriate to exceed such standards for a variety of reasons that reflect specific project criteria based on client needs, budget, site, and other constraints.*

This book is intended as an introduction to the topics covered with the aim of getting the reader comfortable with the basic concepts so that he or she might move forward in design education or on to additional research in certain areas. To that end, an annotated references section is provided at the end of each chapter. Thinking of the information provided in each chapter as basic building blocks that allow for the discovery of the issues involved is a helpful approach in using this book (Figure 1-1).

There is much that goes into the design of a dwelling that is not covered in this book; our intent is to focus on the use and design of individual rooms

Figure 1-1 This book covers the design of houses using a basic room-by-room approach.



(again, a building-block approach) so that the reader will have the core information required to understand the design of these individual spaces. This basic informational approach may bring up questions about the role of the interior designer versus the role of the architect. Clearly, the design of the totality of the structure is the role of the architect (or engineer); however, in many cases, the interior designer is taking an increasingly larger role in the design of rooms and spaces.

Interior designers engaged in renovation work can take a lead role in the design of the interior architecture of a space, with a significant hand in the design of a room or many rooms. This is in contrast to notions of the interior designer as the person in charge of materials and furnishings selections only. The authors believe that interior designers and design students must be well versed in the aspects of residential design covered in this book. For example, readers will note that the detailed kitchen and bathroom information contained in this book is applicable to *remodeling* as well as to new construction.

AN OVERVIEW: QUALITY AND QUANTITY

Readers may note that, throughout this book, the authors mention the evolution of the use of rooms, room sizes, and growth of the overall size of the American home. It's worth noting that the authors have a bias toward careful consideration of the *quality* of design rather than the *quantity* of space in a given home. We hope to make clear that the successful design of space requires careful consideration

of the real needs of clients measured against budgetary, code, climate, and site restrictions—all of which require careful development of a project program prior to the beginning of the actual design of the project.

The last hundred years have brought dramatic changes related to the public perception of the design, furnishing, and size of the American house. According to the National Association of Home Builders (NAHB), the "typical" American house built in 1900 was between 700 and 1200 square feet, with two or three bedrooms and one or no bathrooms (2006). The average home built in 1950 was 983 square feet, with 66 percent of homes containing two bedrooms or fewer. These earlier homes are quite a contrast to the 2521-square-foot average found in new single-family homes completed in 2007. However, according to NAHB, "new single-family homes were almost 100 square feet smaller in 2009 than in 2007" (2010). This means that after increasing for decades, new American houses have decreased in size, as indicated in Figure 1-2.

Given the recent downturn in the economy and an increasing interest in conservation, some prospective home buyers seem to be moving in the direction of a desire for smaller, well-planned homes. A recent survey commissioned by *Builder* magazine "unearthed strong demand for smaller homes" pointing to "a new market for a small home, under 1,300 square feet, with the most energy-efficient features possible." The same survey found that "half of new-home shoppers, for instance, said they would pay at least an extra \$5,000 for energy-conserving features."

The authors argue that a larger house is not necessarily a better house and that designing a house that works well on a functional level is more important than mere size in creating a useful and pleasant environment. Additionally, large single-family homes are currently out of the financial reach of many citizens and are seen by some as wasteful in a time when issues of sustainability are increasingly engaging the national consciousness.

Consideration of housing size and use of related resources is not unique to this publication. Architect Sarah Susanka's book *The Not So Big House* has proven very popular, has helped many people to consider quality over quantity of space, and has certainly had an impact on the design of many homes (1998). *A Pattern Language*, by Christopher Alexander and colleagues, an earlier book and one considered seminal by many, has at its core the notion that spaces should be designed for the way people really live and that good design can be accessible for all (1977).

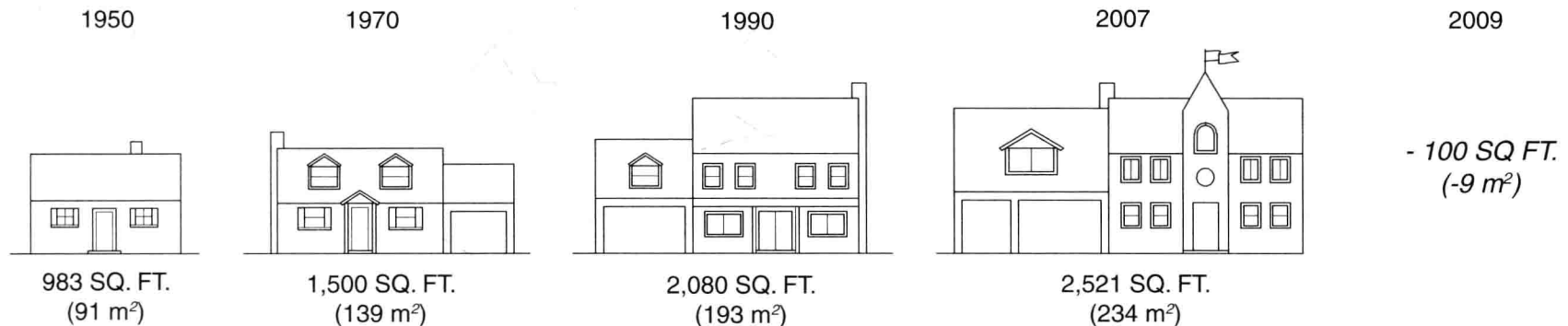


Figure 1-2 The average new home in the United States has grown in size over time—despite the fact that family size has grown smaller. However, larger is not necessarily better, and well-planned spaces need not be excessively large. Given land and construction costs, as well as environmental concerns, smaller, well-designed houses may be a future trend. For the first time in decades, the size of new family homes actually decreased by almost 100 square feet (9.29 m²). Numbers for square footage shown do not include garage spaces.

The notion of seeking quality of design, rather than quantity of space, is shared by many, and yet larger and larger houses continue to be built to house very small family groups. This dichotomy suggests that two opposing popular views of space exist. Although the architect Philip Johnson was once quoted as saying “architecture is the art of wasting space,” clearly that was a bit tongue in cheek, and we concur more with Walt Whitman’s notion that “every cubic inch of space is a miracle”—or should be.

The remainder of this chapter covers issues that relate to housing and serve as an introduction to the concepts that are covered in each chapter. In addition, basic interior design graphics are covered as an introduction to chapter illustrations.

HUMAN BEHAVIOR AND HOUSING

Environmental designers—including interior designers—benefit from gaining an understanding of human behavior as it relates to privacy, territoriality, and other issues related to the built environment studied by social scientists. Privacy can be defined as having to do with the ability to control our interactions with others. According to Jon Lang: “The ability of the layout of the environment to afford

privacy through territorial control is important because it allows the fulfillment of some basic human needs” (1987). Lang goes on to state that the single-family detached home “provides a clear hierarchy of territories from public to private.”

Lang also states that “differences in the need for privacy are partially attributable to social group attitudes.” He continues, “Norms of privacy for any group represent adaptation to what they can afford within the socioeconomic system of which they are a part.” From Lang’s comments, we can learn that the need for privacy is consistent but varies based on culture and socioeconomic status.

The notion of territory is closely linked to privacy in terms of human behavior. There is a range of theories about the exact name and number of territories within the home. One, developed by Clare Cooper, describes the house as divided into two components: the intimate interior and the public exterior (1967). Interestingly, Cooper (now Cooper Marcus) later wrote *House as a Mirror of Self: Exploring the Deeper Meaning of Home* (1995), which traces the psychology of the relationship we have with the physical environment of our homes, and in which she refers to work being done by Rachel Sebba and Arza Churchman in studying territories within the home. Sebba and Churchman have identified areas within the home as those used by the whole family, those belonging to a subgroup (such as siblings or parents), and those belonging to an individual, such as a bedroom or a portion of a room or a bed (1986). Figures 1-3a and 1-3b illustrate various theoretical approaches to territory and privacy.

The term *defensible space*, coined by Oscar Newman, refers to “a range of mechanisms—real and symbolic barriers . . . that combine to bring an environment under the control of its residents.” Defensible space, as described by Newman, includes *public*, *semipublic*, *semiprivate*, and *private territories* (1972).

For the most part, Newman's public spaces, such as streets and sidewalks, are those not possessed by any individual. Semipublic spaces include those areas that may be publicly owned but are cared for by homeowners, such as planted parkways adjacent to sidewalks. Semiprivate spaces can include yards or spaces owned in association (some theoreticians include porches and foyers in this category). Private territory is the interior of one's home or fenced areas within a yard or even the interior of a student's dorm room.

Newman's notions of defensible space and related territories have significant implications for planners, architects, and interior designers because taking them into account in designing homes can help to create spaces in which residents feel safe and have a genuine control over their immediate environment. See Figures 1-3a and 1-3b.

In *A Pattern Language*, mentioned earlier, Christopher Alexander and his colleagues describe territories as falling along an *intimacy gradient*, which is a sequence of spaces within the building containing public, semipublic, and private areas. The bedroom and bathroom are the most private, and the

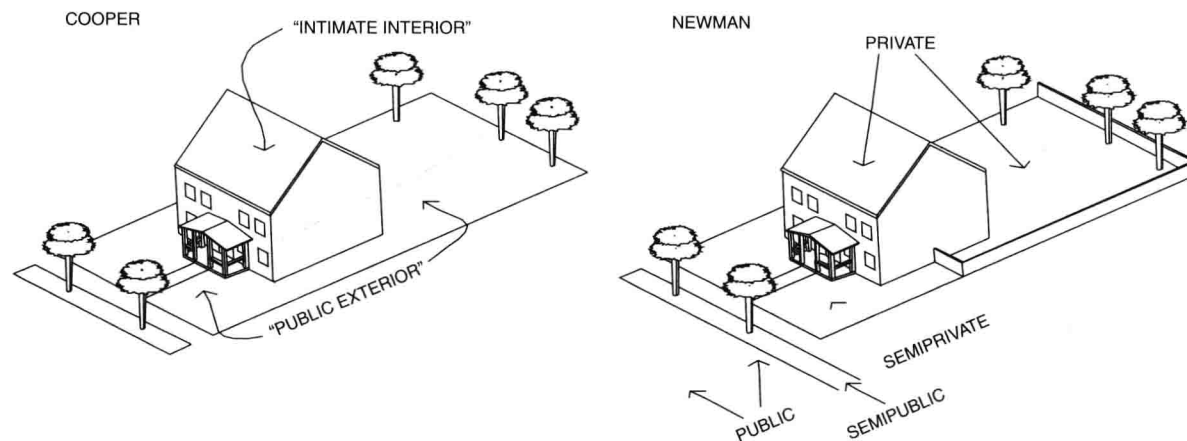


Figure 1-3a An illustration of territories as identified by theoreticians. Cooper identifies a public exterior and an intimate interior. Newman identifies public territories, which are not possessed or claimed; semipublic territories such as sidewalks, which are not "owned" but are seen as being possessed nonetheless; semiprivate territories, which are shared by owners or seen as being under surveillance by neighbors, such as front yards or shared swimming pools; and private territories such as the interior of a house or a fenced-in backyard.

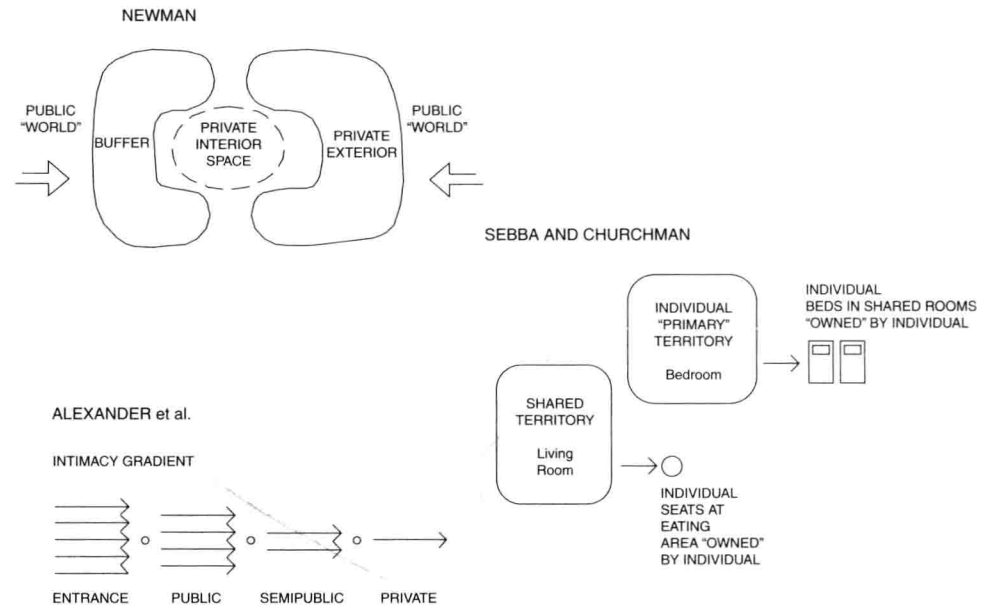
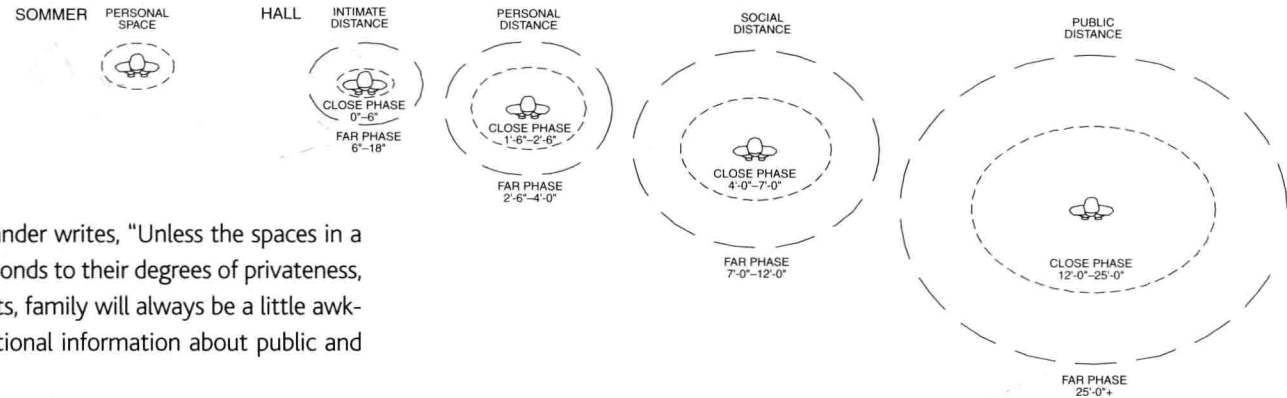


Figure 1-3b An illustration of territories related to interior space as identified by theoreticians. Newman describes the need for a buffer between the public world and private interior territories. Sebba and Churchman describe areas within a home as "shared territory" when used by all, with limited privacy; "individual primary territories" are those seen as belonging to individuals, such as a bedroom, which becomes the private sanctuary of the individual. Alexander et al. describe an intimacy gradient with the most public spaces related to the entrance leading to a sequence of increasingly private spaces.

Figure 1-4 Sommer's personal space and Hall's body distances.



porch or entrance space is the most public. Alexander writes, "Unless the spaces in a building are arranged in a sequence which corresponds to their degrees of privateness, the visits made by strangers, friends, guests, clients, family will always be a little awkward." See Figure 1-3b. Chapter 2 provides additional information about public and private spaces as they relate to the entry spaces.

Personal space is a term introduced by Robert Sommer in the 1960s. According to Sommer, "personal space refers to an area with an invisible boundary surrounding the person's body into which intruders may not come" (1969). See Figure 1-4.

A similar-sounding term expresses a different concept and comes from work done by Edward Hall, an anthropologist who coined the term *proxemics*—for the "interrelated observations and theories of man's use of space as a specialized elaboration of culture" (1966). Hall identified four distinct body distances or boundaries that people will maintain in varying social situations: *intimate* (0 to 18 inches), *personal-casual* (1½ to 4 feet), *social-consultative* (4 to 12 feet), and *public* (12 feet and beyond). Hall found that while actual spatial boundaries vary based on cultural differences, the concepts of intimate, personal, social, and public distances are consistent cross-culturally. Figure 1-4 also illustrates the spatial boundaries identified by Hall.

Hall's term *personal distance* refers to the distance maintained between friends and family members for discussion and interaction, whereas Sommer used the term *personal space* to refer to the invisible, territorial boundary around each person. Similarly, Hall's *intimate space* is a "bubble" of space around a person that can only be entered by intimates, whereas *social-consultative spaces* are those in which people feel comfortable engaging in routine social interaction for business or in conversation with strangers. *Public space* is that where there is little interaction and people are generally comfortable ignoring one another; this distance also allows one to flee when danger is sensed.

Considering Hall's spatial boundaries can be useful for designers in planning living spaces. For example, most casual social interaction takes place within personal distances. Later portions of this book focus on specific room-related dimensional

information for encouraging interaction and creating privacy. It is also worth noting that in designing public and commercial spaces that encourage interaction and help users attain privacy, the designer will find it helpful to reference the work of social scientists such as Hall, Newman, Lang, and others. For those seeking additional information about environmental psychology and the related work of other social scientists, the references at the end of this chapter include related bibliographic information.

AN OVERVIEW OF CHAPTER TOPICS

Generally, the remainder of this first chapter is organized in a manner that is similar to most of the later chapters covering individual rooms and spaces. This chapter serves as an introduction to the definitions, concepts, and organizing principles that will be used throughout this book. Topics are as follows:

- Accessibility, universal design, and visitability
- Sustainability (also listed in relationship to specific items as necessary and not covered in detail in rooms that do not present specific challenges)
- Ergonomics and required clearances
- Organizational flow
- Related codes and constraints
- Electrical and mechanical
- Lighting (while lighting is clearly part of the electrical system, we have separated it merely for purposes of organization)

ACCESSIBILITY NOTE

Throughout this book, content related to accessible design is treated visually similar to this, in order to make it easy to reference.

Accessibility, Universal Design, and Visitability

Initially used to describe environments that do not present physical barriers for people with physical limitations, such as wheelchair users, the term *accessible* now describes design, including graphics and Web design, that considers the needs of users with a wide range of both physical and cognitive abilities and limitations. According to Dr. Edward Steinfeld of the Center for Inclusive Design and Environmental Access (IDEA Center), “Accessible design allows people with disabilities to demonstrate that they have capabilities—to work, manage a household, marry and raise children [—that] they can play a vital role in the community” (1996).

Generally, the design of private, single-family homes is not mandated by any current accessibility regulations except as noted later in this chapter. However, many homeowners seek residences that are accessible, either because they plan to “*age in place*” in the home (i.e., grow old in one’s home without having to relocate) or because they or a family member have current needs that warrant the design of accessible spaces. These two distinct scenarios present two distinct design criteria.

In cases where current physical or other limitations create the need for accessible spaces, the design should address the specific needs of the owner or family member. For example, designing a home for a specific person who uses a wheelchair requires meeting a set of appropriate criteria and guidelines, whereas designing a home for a person with a vision impairment requires considering a different set of standards and guidelines.

In contrast, designing a home for aging in place or for general accessibility requires making design decisions based on basic accessibility standards and guidelines. These are presented throughout this book as part of the body of each chapter. Incorporating accessibility information for each area is intended to provide readers with a comprehensive view of accessible design. Information about regulations and standards for accessibility is provided in the “Related Codes and Constraints” section of this chapter.

In cases where a home is intended to be wheelchair accessible, adequate clearance space must be provided for the chair as the user accesses items for daily activities; in addition, appropriate circulation space and turning space must be provided. See Figure 2-14b for specific information about wheelchair-accessible circulation and clearance requirements.

The concept of *universal design* grew, in part, out of the accessible design movement but is not synonymous with accessibility. Ron Mace, an architect, product designer, and educator, is credited with coining the term; he also established what is now the Center for Universal Design at North Carolina State University.

According to the IDEA Center (SUNY at Buffalo), universal design can be defined as “an approach to the design of all products and environments to be as usable as possible by as many people as possible regardless of age, ability or situation” and that “results in better design and avoids the stigmatizing quality of accessible features that have been added on late in the design process or after it is complete.” In “Accessible Design Can Be Beautiful,” Nancy Mannucci, a designer living with multiple sclerosis, writes, “Universal design takes into account multigenerational needs, namely the needs of children, the needs of elderly people, and those who, for whatever reason, have sensory or mobility impairments” (1988).

Universal design is an approach that considers *usability* and is becoming increasingly embraced in product design, architecture, interior design, and urban design, as well as in graphic and Web design. One approach to universal design in the home is the notion of *adaptable* elements that may be designed to offer greater flexibility for a range of occupants. For example, counters can be made so that they are adjustable to adapt for users of varying heights (including those using seats and wheelchairs). Adaptable cabinets can be designed with fronts and bases that can be removed to create a clear area underneath for use by someone in a wheelchair. Illustrations of both of these examples can be found in Chapter 4.

Visitability is a concept that shares some commonalities with universal design concepts; it refers to creating homes that can be visited or accessed by people with physical disabilities. Visitable residences must meet three important criteria found in the following list.

Visitable Home Criteria

- At least one zero-step entrance approached by an accessible route on a firm surface no steeper than 1:12, proceeding from a driveway or public sidewalk.
- Wide passage doors. All main-floor interior doors, including the bathroom, must provide 32 inches (813 mm) of clear passage space.
- At least a half bath/powder room on the main floor.

Eleanor Smith is a founder of Concrete Change, a group that advocates to have visitability ordinances adopted by various jurisdictions, or to be federally mandated. To date, a number of jurisdictions, such as Pima County, Arizona, have adopted visitability ordinances, while others have adopted visitability ordinances for residences built using city funds. (It is worth noting, however, that Pima County allows 32-inch [813-mm] doors providing only 30 inches [762 mm] of clear space.)

Of the three criteria for visitability, the most difficult to achieve nationally is the zero-step entrance requirement. This could prove problematic in parts of the country where basements are commonplace. Typically, the main floor of a house with a basement is 18 to 20 inches (457 to 508 mm) above ground level,

which could require a significant ramp for a zero-step entry. In some cases, through careful building placement and site grading, the driveway and sidewalk to the entrance can be designed with a slope of not more than 1:12 for a zero-step entry. There continues to be controversy within the building community as to the feasibility of making all new houses visitable.

Table 1-1 clarifies the differences among accessible, universal, and visitable spaces.

TABLE 1-1 Differences among Accessible, Universal, and Visitable Spaces

Term	Definition
Accessible	Design, including graphics and Web design, that considers the needs of users with a wide range of both physical and cognitive abilities and limitations.
Universal design	The design of all products and environments to be as usable as possible by as many people as possible regardless of age, ability, or situation.
Visitable design	Creating homes that can be visited or accessed by people with physical disabilities.

Sustainability Note

Throughout this book, content related to sustainability is treated visually similar to this, in order to make it easy to reference.

According to Alice Rawsthorn (2010),

While most designers would agree that sustainability is important, they're very likely to disagree about everything else to do with it. What exactly is sustainable design? What constitutes success? And failure? On what criteria? Different designers may well give very different answers to all of those questions, and more.

As the previous quote indicates, perhaps more than any current area of design, definitions of sustainable design and green design seem to

cause confusion, consternation, contradiction, and a search for clear answers. One way to understand issues of sustainability is to clearly define some commonly used terms and to outline areas of agreement and disagreement.

According to Louise Jones, writing in *Environmentally Responsible Design* (2008), "*sustainable design* suggests a macro perspective on environmental responsibility—protection of the health of and welfare of *global eco systems*," whereas "*green design* suggests a micro perspective," related to protection of health and welfare of the people in the "built environment." And, according to Jones, *environmentally responsible design* (ERD) is "a combination of green and sustainable design."

(continued)

Francis Ching (2008) has defined *sustainability* as “a whole systems approach to development that encompasses the notion of green building but also addresses broader social, ethical and economic issues, as well as the community context of buildings.”

Both Ching and Jones trace the roots of definitions of sustainable design and development to the 1987 United Nations World Commission on Environment and Development. The commission, also known as the Brundtland Commission, after Gro Harlem Brundtland (its chairman), defined *sustainable development* as follows:

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- the concept of “needs,” in particular the essential needs of the world’s poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs.

Internationally, England established the Building Research Establishment Environmental Assessment Method (BREEAM) in 1990, which was the first environmental assessment tool to be used internationally. The tool was created to be used in analysis of new and existing buildings in terms of review and improvement of office buildings. BREEAM has been used as a model for systems developed in other countries. In addition, several European countries have joined efforts to define methodology for life-cycle analysis of buildings.

The World Green Building Council (WorldGBC) is a union of international green building councils that seeks to “facilitate the global transformation of the building industry toward sustainability.”

In seeking out helpful definitions, it is worth noting that the U.S. Environmental Protection Agency (EPA, 2010) has defined *green building* as:

The practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building’s life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction. . . . Green building is also known as a sustainable or high performance building.

The EPA (2010) also indicates that:

Green buildings are designed to reduce the overall impact of the environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation

According to the EPA, important developments in the United States related to green building history include those listed in Table 1-2.

The EPA has also identified the items covered in Table 1-3 as impacts of the built environment.

TABLE 1-2 Recent Green Building History in the United States

Historical Development	Year
American Institute of Architects (AIA) formed the Committee on the Environment (COTE).	1989
Environmental Resource Guide published by AIA, funded by EPA.	1992
EPA and the U.S. Department of Energy launched the Energy Star program.	1992
Executive Order 13123: Greening the Government through Efficient Energy Management.	1992
First local green building program introduced in Austin, Texas.	1992
U.S. Green Building Council (USGBC).	1993
USGBC started Leadership in Energy and Environmental Design (LEED version 1.0 pilot program).	1998
Energy Policy Act: includes building standards for federal buildings.	2005
The Energy Independence and Security Act of 2007.	2007
EPA adopted a new Green Building Strategy guide for EPA buildings.	2008
The International Code Council began development of the International Green Construction Code (IGCC).	2009
American Institute of Architects (AIA) created the 2030 Commitment, asking organizations to pledge to advance the goal of carbon neutral buildings by 2030.	2009
The International Green Construction Code (IGCC) Version 1.0 and 2.0 released for public comment.	2010

TABLE 1-3 Environmental Impacts of the Built Environment According to the EPA

Aspects of Built Environment	Consumption	Environmental Effects	Ultimate Effects
Siting (building site)	Energy	Waste	Harm to human health
Design	Water	Air pollution	Environmental degradation
Construction	Materials	Water pollution	Loss of resources
Operation	Natural resources	Indoor pollution	
Maintenance		Heat islands	
Renovation		Storm water runoff	
Deconstruction		Noise	

As one evaluates products and design solutions, it is worth measuring their impact as indicated in Table 1-3. This means not only assessing initial product sourcing or production but also considering how the demolition (deconstruction) may impact the environment.

Reviewing history and defining terms related to sustainability can provide a context and a framework for understanding this rather complex aspect of current design practice. Based on the definitions found in the preceding paragraphs, for the remainder of this book, we will use the following definitions.

Defining Sustainability

Sustainable can be seen as a "whole-systems approach to development that encompasses the notion of green building but also addresses broader social, ethical and economic issues . . ." (Ching, 2008).

Green building (or green design) is the design of buildings that are efficient in the use of resources, limit the impact of building on the environment, and incorporate sustainable materials in their construction—all of which make green building part of sustainable development.

Green building standards programs include those certified by LEED, those in process to be required by the International Green Construction Code (IGCC); a variety of product standards and certification programs, including McDonough Braungart Design Chemistry (MBDC); and local codes and building legislation.

The term *LEED* refers to the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Green Building Rating System, a set of green construction standards that are currently the most widely recognized in the United States. In addition to setting standards that result in a building's receiving LEED certification, USGBC also grants LEED professional credentials for design and construction professionals (this is done in conjunction with the Green Building Credential Institute [GBCI]). Specific information about LEED building rating systems can be found in Appendix A.

The *International Green Construction Code (IGCC)* is a model code developed by the American Institute of Architects and ASTM International, and others, in keeping with the American Institute of Architects 2030 Carbon Neutrality Goal. The IGCC is considered by its developers to be an "overlay" code in that it is intended to work in tandem with other I-Codes. This code is scheduled to be published in 2012 and is currently available for public comment in Version 2.0. Additional information about IGCC can be found in Appendix A.

MBDC is based on the framework developed by William McDonough and Michael Braungart and described in their book, *Cradle to Cradle: Remaking the Way We Make Things*. As indicated on the MBDC Web site, this framework "moves beyond the traditional goal of reducing the negative impacts of commerce ('eco-efficiency'), to a new paradigm of increasing its positive impacts ('eco-effectiveness')." This approach addresses the use of energy, water, and social responsibility; MBDC sets criteria for C2C certification of products, produces case studies, and consults with a wide range of clients.

In addition to LEED, IGCC, and MBDC, there are a number of programs that provide certification and standards for "green" products and materials; some of these are listed in Appendix A. Such standards are one way for designers to seek out products that meet some of the criteria set by the EPA as follows:

Green buildings may incorporate *sustainable* materials in their construction (e.g., *reused*, *recycled-content*, or made from *renewable resources*); create *healthy indoor environments* with *minimal pollutants* (e.g., reduced product emissions); and/or feature landscaping that *reduces water usage* (e.g., by using native plants that survive without extra watering).

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