

ROSEMARY KILMER AND W. OTIE KILMER

CONSTRUCTION DRAWINGS AND DETAILS

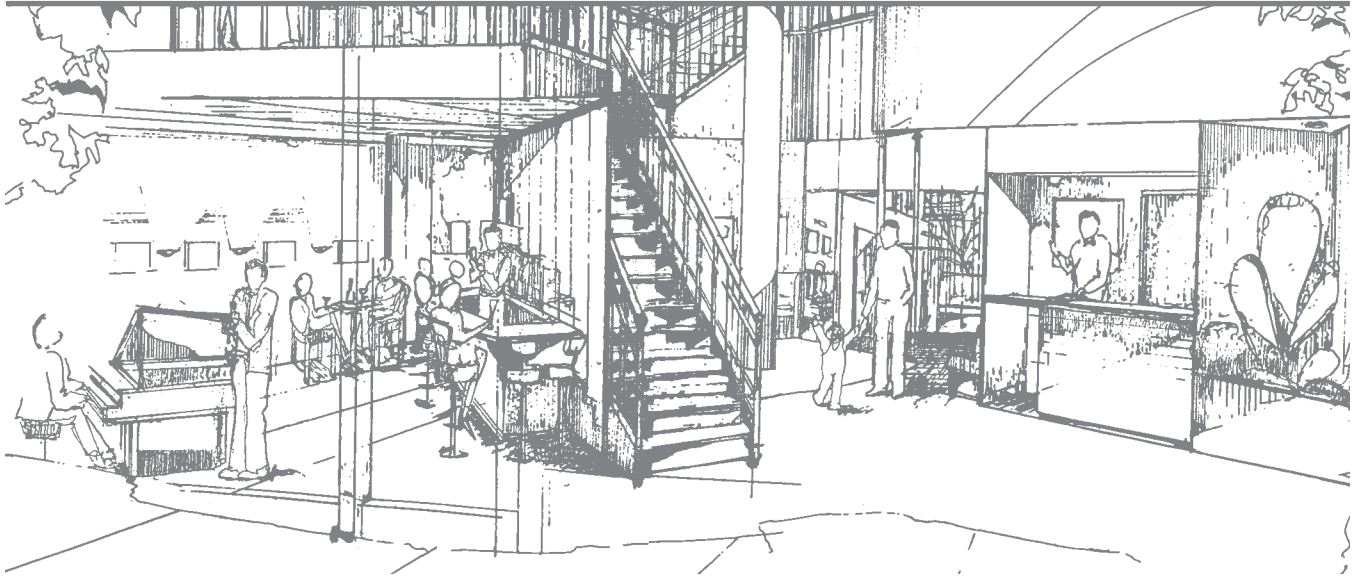
FOR INTERIORS



FOURTH EDITION



WILEY



Construction Drawings and Details for Interiors

FOURTH EDITION

ROSEMARY KILMER AND W. OTIE KILMER

WILEY

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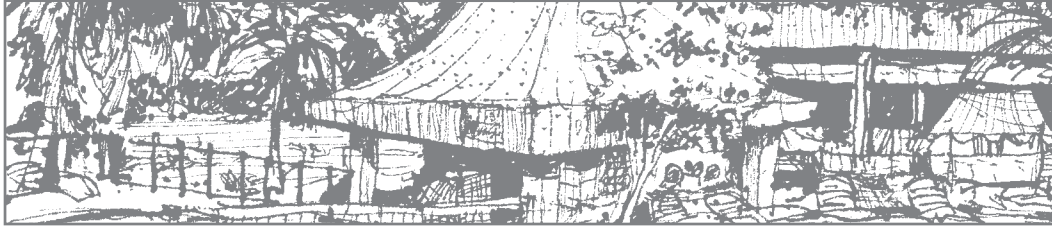
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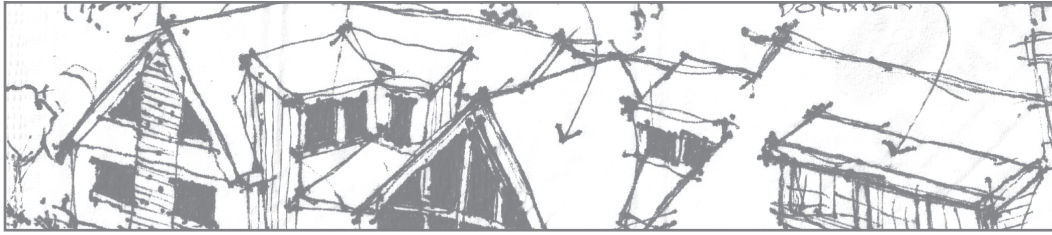
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Preface

The fourth edition of this book expands upon the third edition, includes some new topics, and incorporates new images. The authors again wish to thank the many students, teachers, and professionals who used the former editions giving us valuable input as to what needed to be revised, expanded, or added.

When *Construction Drawings and Details for Interiors: Basic Skills* was first published over seventeen years ago, the intent was to provide a guide (handbook) for preparing construction drawings for the field of interior design. The book was designed for students in interior design programs as well as interns in offices that design interiors and are expected to produce construction drawings. At the time of the first edition, there were no books on the market that dealt with the process of preparing construction drawings specifically for interiors and all the information that needed to be conveyed, or that go in depth to explain how to organize this vast amount of information into a quality set of construction documents.

In this fourth edition of *Construction Drawings and Details for Interiors*, basic and advanced skills are covered. The entire process—from beginning drawing/drafting skills through design development, and finally construction documents—is presented. There are also several changes and additions in this fourth edition. Interior designers must be able to communicate with other professionals in the building industry and must understand how a building is constructed from the ground up. Today, interior designers are required to understand a vast amount of knowledge about construction assemblies, materials, finishes, lighting, mechanical and electrical systems, building codes, and structural systems. Therefore, we have updated this information throughout this addition where applicable.

Chapter 1 has been expanded under “Issues Affecting How Interior Designers Communicate” to include the pandemic of 2020, more building certification programs, and parametric design. Chapter 3 has been expanded to include a section on “Starting the Drawing” with a step-by-step method to basic techniques of hand drafting. Plus, a checklist has been added to this chapter.

A new section on Contract Administration has been added to Chapter 6 discussing the importance of record keeping and the various activities and forms involved during the construction process. Documents that interiors designers should be aware of include requests for information (RFI), change orders (CO), submittal review, field reports, and punch lists. Examples of these forms have been included, as well as an example of a revised plan with a highlighted by a revision “cloud”.

Laser and sonic measuring devices for field measuring was added in chapter 7 and a new illustration of doors as defined by operation was added to chapter 8. Numerous updates and illustrations were added to all chapters including current usage of light emitting diodes (LED) lamps to chapter 17.

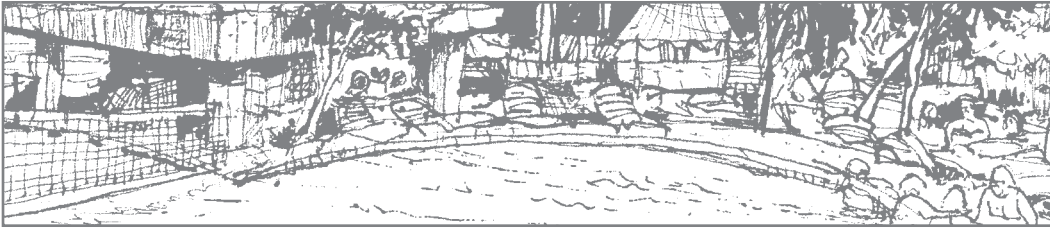
The checklists at the end of each chapter have been expanded in scope. Forty-nine new illustrations have been added or updated to more clearly show the specifics discussed in the writings.

The glossary has been expanded to include more terms used in the building industry. Appendices have been updated to match current standards related to the preparation of construction drawings for interiors. Appendix C “Trigonometric Functions: Sines and Cosines of Angles,” has again been included to assist with some lighting calculations as is explained in Chapter 17.

Another area that has been expanded to provide good resources for instructors is the *Instructor’s Guide*, which is available through a dedicated Wiley website. It includes a summary of each chapter with *Learning Outcomes* and *Key Terms* to help in the organization and teaching a course. Sample exam questions and answers for each chapter are provided to encourage critical thinking and discussion. These sample questions along with some suggested activities can assist instructors in evaluating students’ comprehension of the material presented. PowerPoint presentations are included for each chapter to help instructors’ present visual information for teaching and engaging students for better understanding.

Another feature is a dedicated website for students (available on the Wiley website). It includes flash-cards and interactive self-test questions, as well as photographs and case study construction drawings for both residential and commercial interior projects. This student website will provide students with additional resources for understanding the design and construction industries.

In conclusion, we are committed to the interior design profession and continue to be involved in the future of designing interiors and look forward to any comments or input on this edition and for future editions.



Acknowledgments

Writing the fourth edition of this book has been a satisfying and learning experience. It has taken the knowledge and skills of several people to bring this fourth edition to print. The authors wish to express their sincere thanks to the following people who helped in the development of new material, revision of existing information, and preparation of this edition.

First, we would like to thank our former students, who showed their enthusiasm to learn more and more each year, which challenged us to keep abreast of the issues and best practice standards facing the interior design profession.

Special appreciation is expressed to the professionals and organizations that provided us with illustrations and permissions to use their materials to make this edition a strong visual experience. Thanks to Luke Kwan of IA Interior Architects for providing us with his professional experience and several new illustrations for this edition. Again, we are thankful to KJG Architecture, Inc.; Maregatti Interiors; HKS, Inc.; Perkins+Will; and Chapman Sisson Architects for supplying professional examples for this book. Every effort has been made to correctly supply the proper credit information.

We are grateful to a number of interior design educators for their helpful suggestions as to what needed to be revised or included in this edition to keep this book as a strong complement for the teaching of Construction Drawings and Details for Interiors.

We are very grateful to the dedicated staff at John Wiley & Sons for their guidance, assistance, and dedication to this edition. We are particularly indebted to Amy Odum, senior production editor, for guiding us through the editing and production phase of this project. We are also grateful to (we need Wiley names and titles here, please) and to the rest of the editorial, production, and design staff at John Wiley & Sons, who helped turn the manuscript into a finished publication.

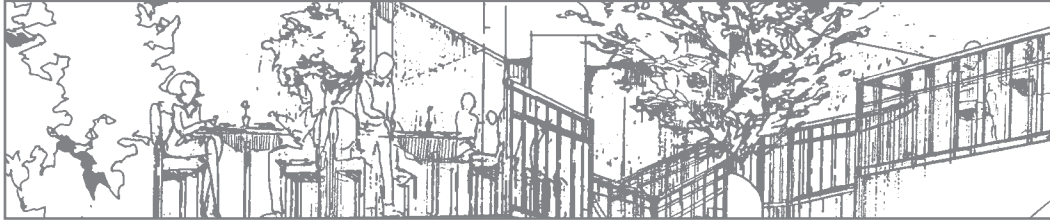
A special thanks to Lisa VanZee and Courtney Johnston, our daughters, as well as Jeff Johnston, our son-in-law, who again we rely on for their professional experience as to contemporary standards and best practices in the architecture and interior design professions.

Most of all, we would again like to acknowledge each other's support (Otie and Rosemary) as we continue to update these textbook editions for the students, teachers, and professionals involved in interior design.



PART
1

Drawing Communication, Equipment, Fundamentals, and Classification Systems



1

Design as Communication

Ideas and plans are formed in the interior designer's mind, but to be transformed into reality, they must be communicated to others. Although a designer might have a great idea, it must be effectively communicated, or it will remain just an idea and never move beyond conception. Interior designers and other professionals in the building industry use drawings as the primary means of developing and sharing their ideas. Interior designers and architects do a lot of sketching and drawing. They develop their skills in freehand drawing by sketching existing objects and spaces in the environment (Figure 1.1).

These same skills of observation and sketching are then used in ideation and visualizing designs for new spaces and objects (Figures 1.2 and 1.3).

This process of brain, eye, and hand coordination is an intrinsic part of design. Architectural drawings can be grouped into three basic types: drawing as idea generation, drawing as a design and presentation medium, and drawing as a guide for the construction process. There are distinct differences between each of these types, yet they all contain some common drawing tools, techniques, standards, and graphic language.

Design communication is also influenced by issues that regulate the building industry, such as building codes that protect the health, safety, and welfare of the public. Currently, other issues, such as universal design, user participation, sustainability and green building certification programs, globalization, digital technology and building information modeling (BIM), affect the way designers communicate their ideas.

DRAWING FOR IDEA GENERATION

Idea generation assists the designer in working through and visualizing the solution to a problem. Designers use many different types of drawings to generate and bring to reality their creative ideas.

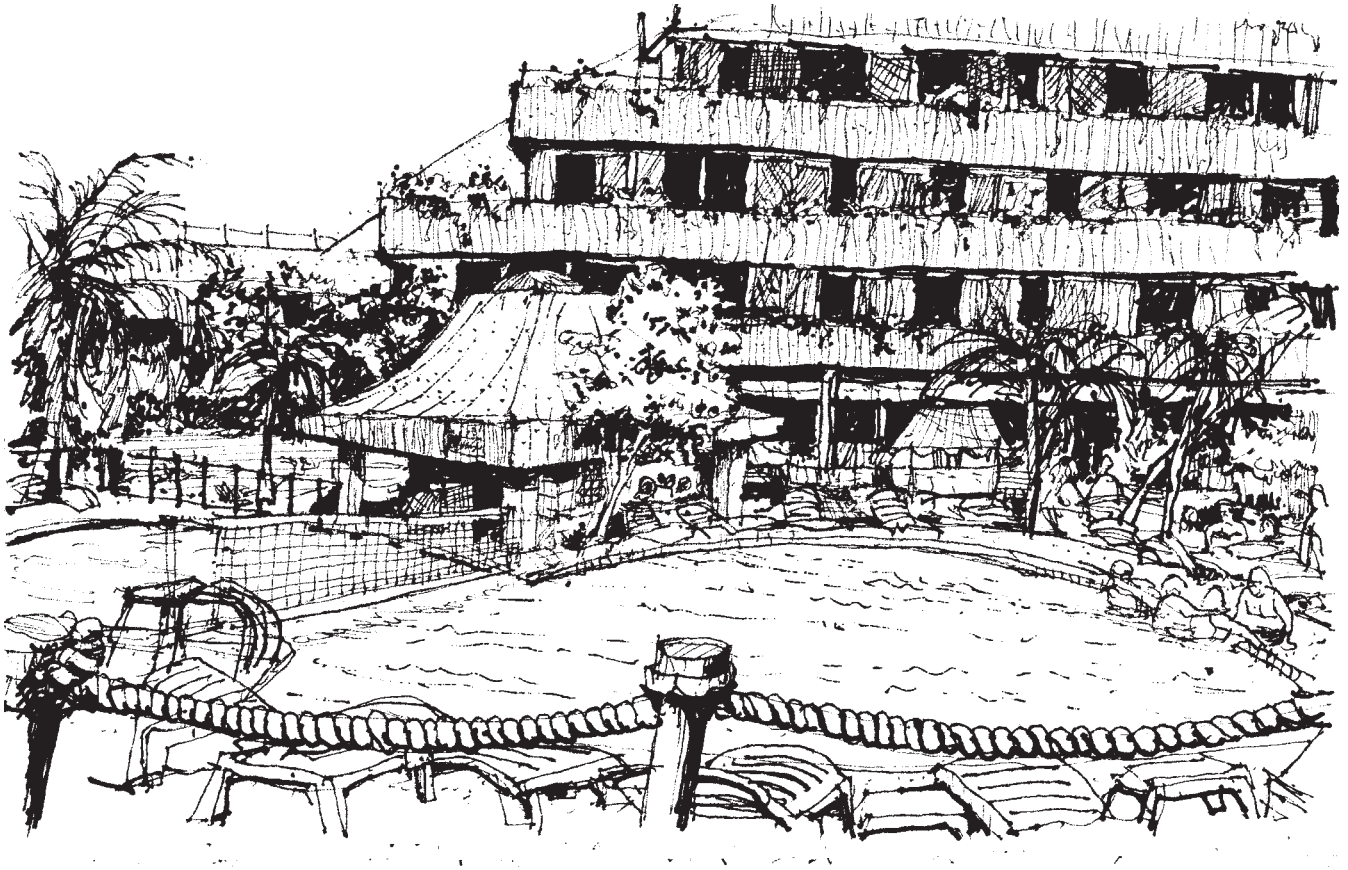


FIGURE 1.1. Sketching existing objects and spaces help designers develop their freehand drawing skills.

These drawings can be in the form of quick freehand sketches illustrating different kinds of views (Figure 1.4).

Many times, these types of drawings are not shown to clients, but are used solely to help designers shape their ideas into a visual form. The drawings are not intended to be the final solution to an idea, but rather to allow the designer to explore alternatives or refine an idea. They also help to record designers' two- and three-dimensional thinking. These concept sketches and drawings are part of a sequence of design steps referred to as the *design process* (Figure 1.5). See Chapter 5 for more detailed information on "Concept Development and the Design Process."

DRAWING AS DESIGN AND PRESENTATION MEDIA

Once a designer has developed an idea to a point that visual communication is needed to show it to the client or others, new drawings must be created for use as presentation media. These drawings depict the parameters of an idea in more detail yet are not totally worked out to a point that they can serve as an accurate construction guide. Design drawings can range from pictorial renderings of an idea (Figure 1.6) to more detailed plan views of a building's interiors (Figure 1.7). In the first example, a rendering is often done as a perspective view (Chapter 4), which resembles a photograph.

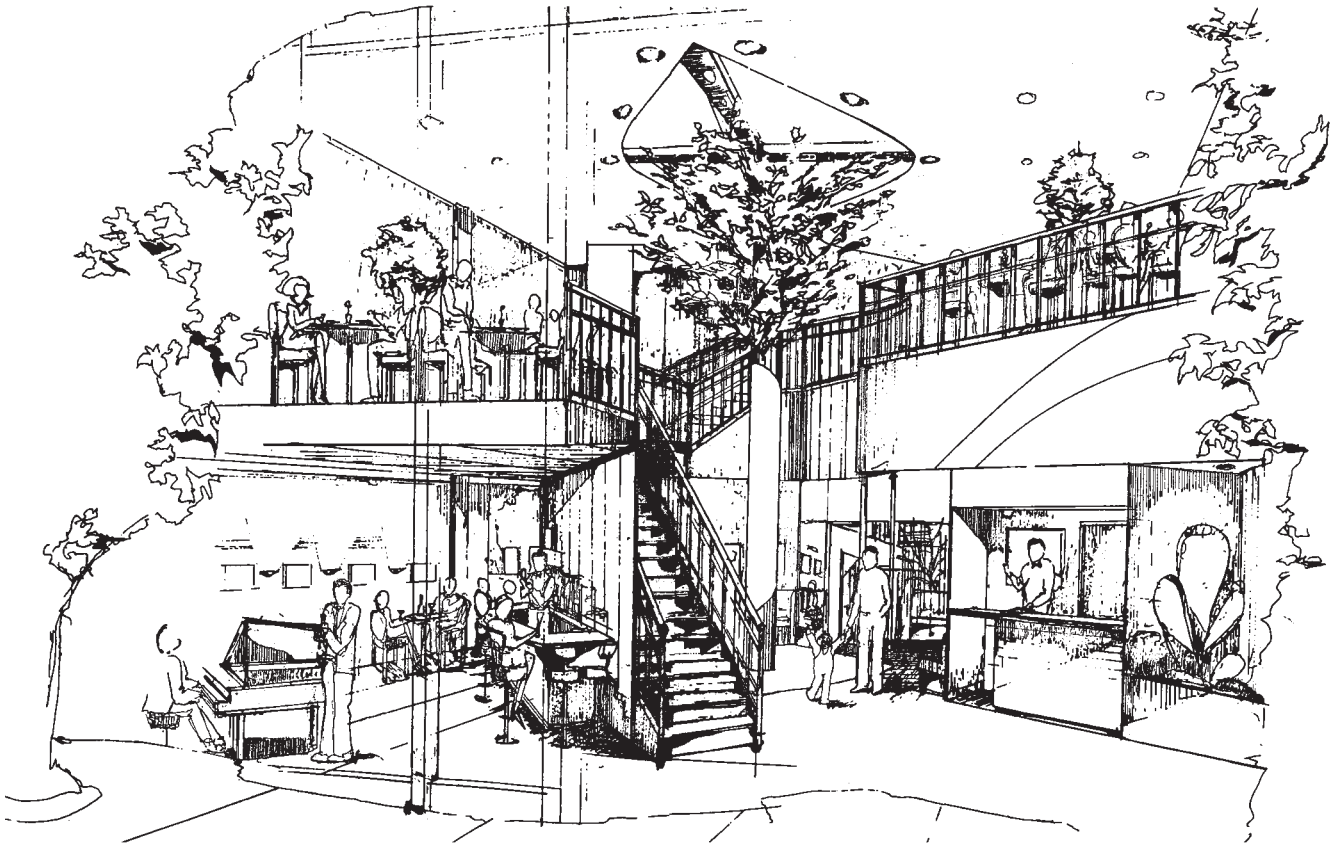


FIGURE 1.2. Designers can use their freehand drawing skills to visualize and sketch new spaces and objects.

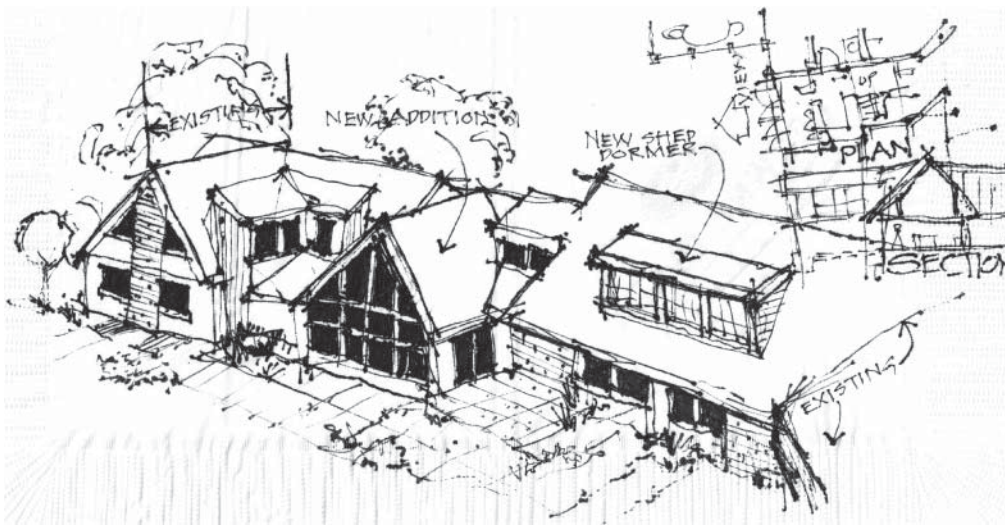


FIGURE 1.3. An example of a sketch for an addition to a residence that was drawn on a napkin in front of the client.

The receding lines of an object are purposely drawn to a distant vanishing point—similar to the effect of railroad tracks that appear to touch at the horizon. Design drawings are also done using techniques other than perspectives, such as the isometric shown in Figure 1.8. Different types of drawings are discussed further in Chapter 4.

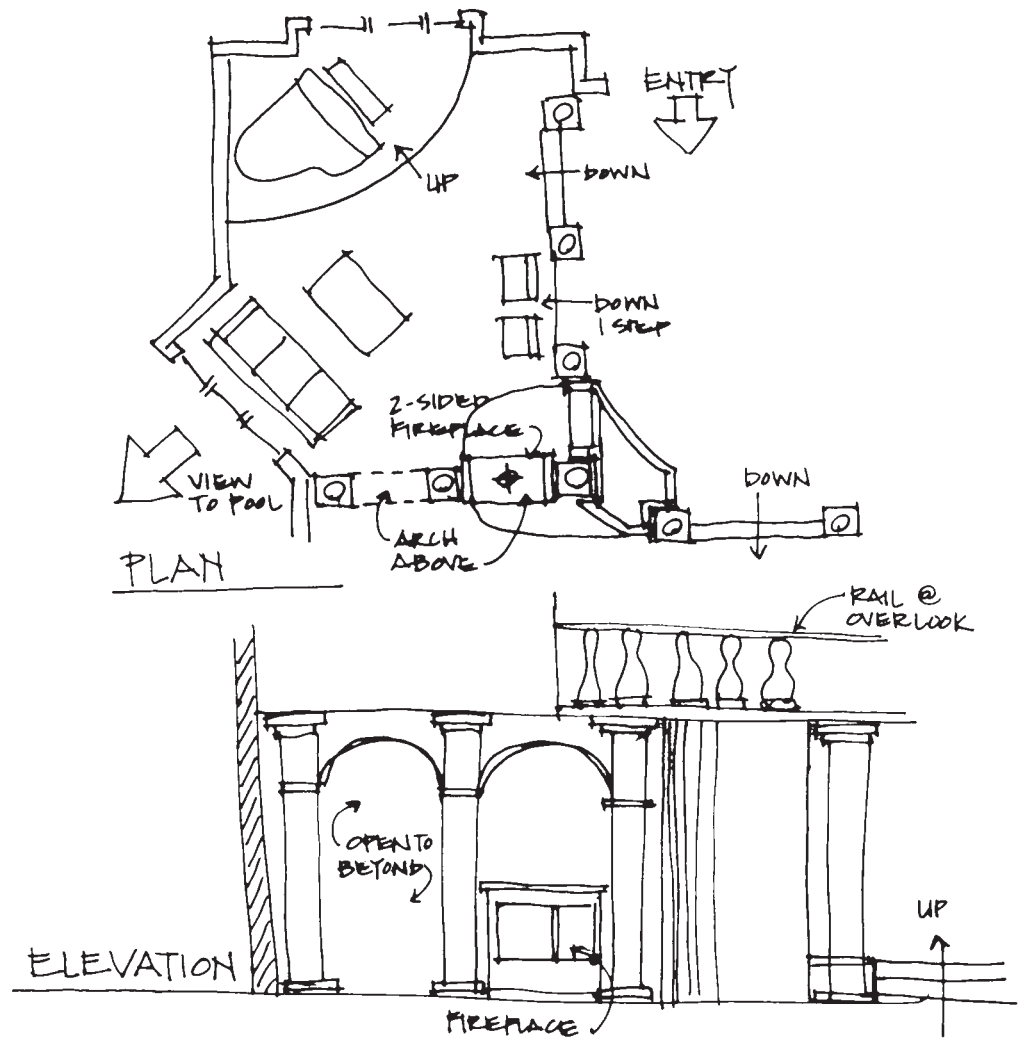


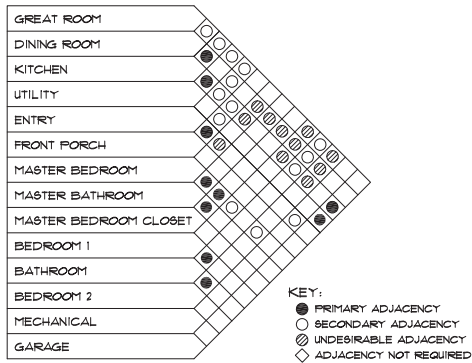
FIGURE 1.4. Quick freehand sketches, such as this floor plan and elevation, can be used to bring designers' creative ideas to reality. Courtesy of Courtney Johnston.

DRAWING AS A GUIDE FOR CONSTRUCTION

Drawings serve as the prime means of communication for constructing buildings, interior spaces, cabinets, furniture, and other objects. Construction drawings are scaled, detailed, and accurate representations of how an object looks and how it is constructed as well as the materials used (Figure 1.9). The drawings follow established architectural graphic conventions to indicate sizes, material, and related information that is needed to bring the objects or spaces into reality (Figure 1.10). The builder needs clear, concise drawings that are directly related to the different views of an object, such as plans, elevations, sections (Figure 1.11), and other drawing types that are discussed in later chapters.

ISSUES AFFECTING HOW INTERIOR DESIGNERS COMMUNICATE

Interior design is a constantly changing discipline that is affected by societal, environmental, and technological changes. The major impact on how interior designers communicate has been the pandemic of 2020. This pandemic has affected how and where designers work as well as how they physically interact with colleagues, clients, manufacturers, suppliers, builders, and other trades. This has led them to rely more on technology to design and communicate with others. The pandemic has also placed greater emphasis on hygienic solutions, such as “touch-free” products.



ADJACENCY MATRIX

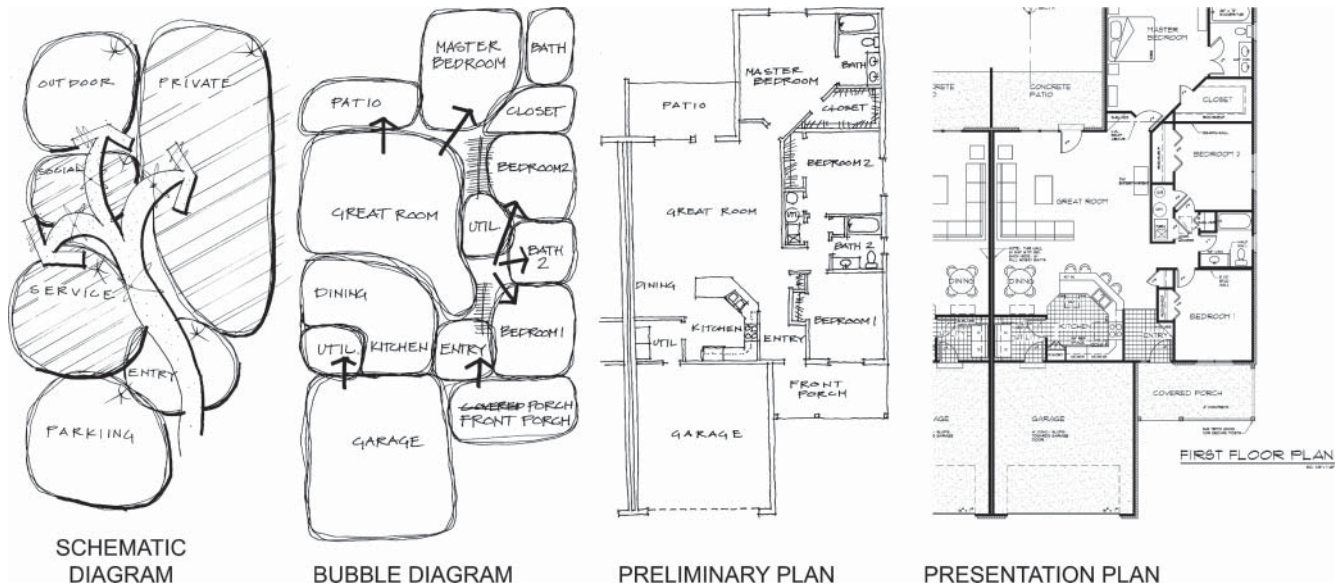


FIGURE 1.5. Adjacency matrices, concept sketches, and drawings are part of a sequence of design steps known as the design process.

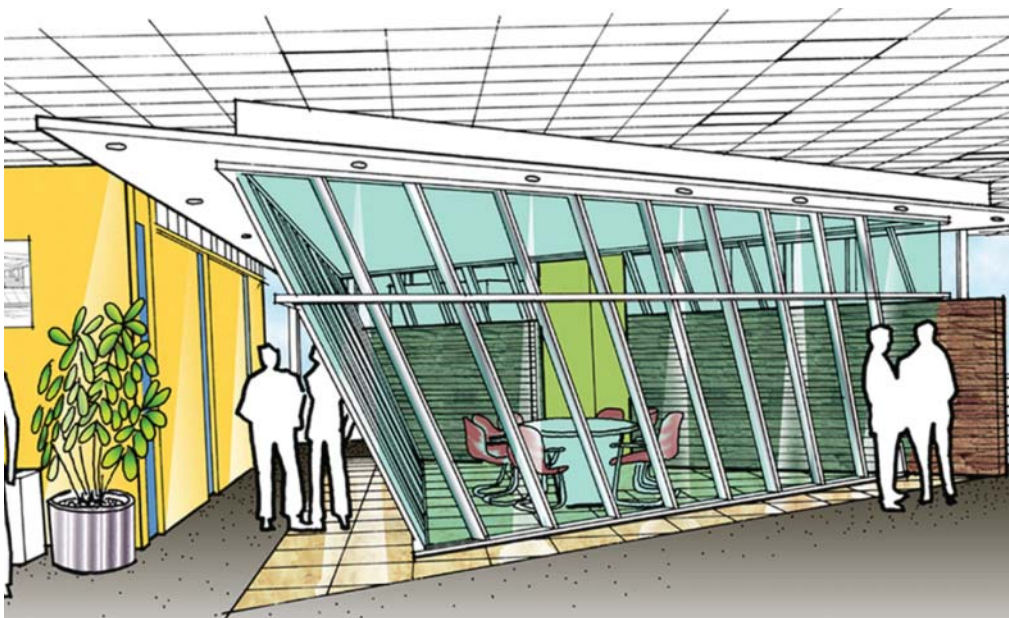


FIGURE 1.6. Design drawings, such as this pictorial rendering, show ideas in more detail.

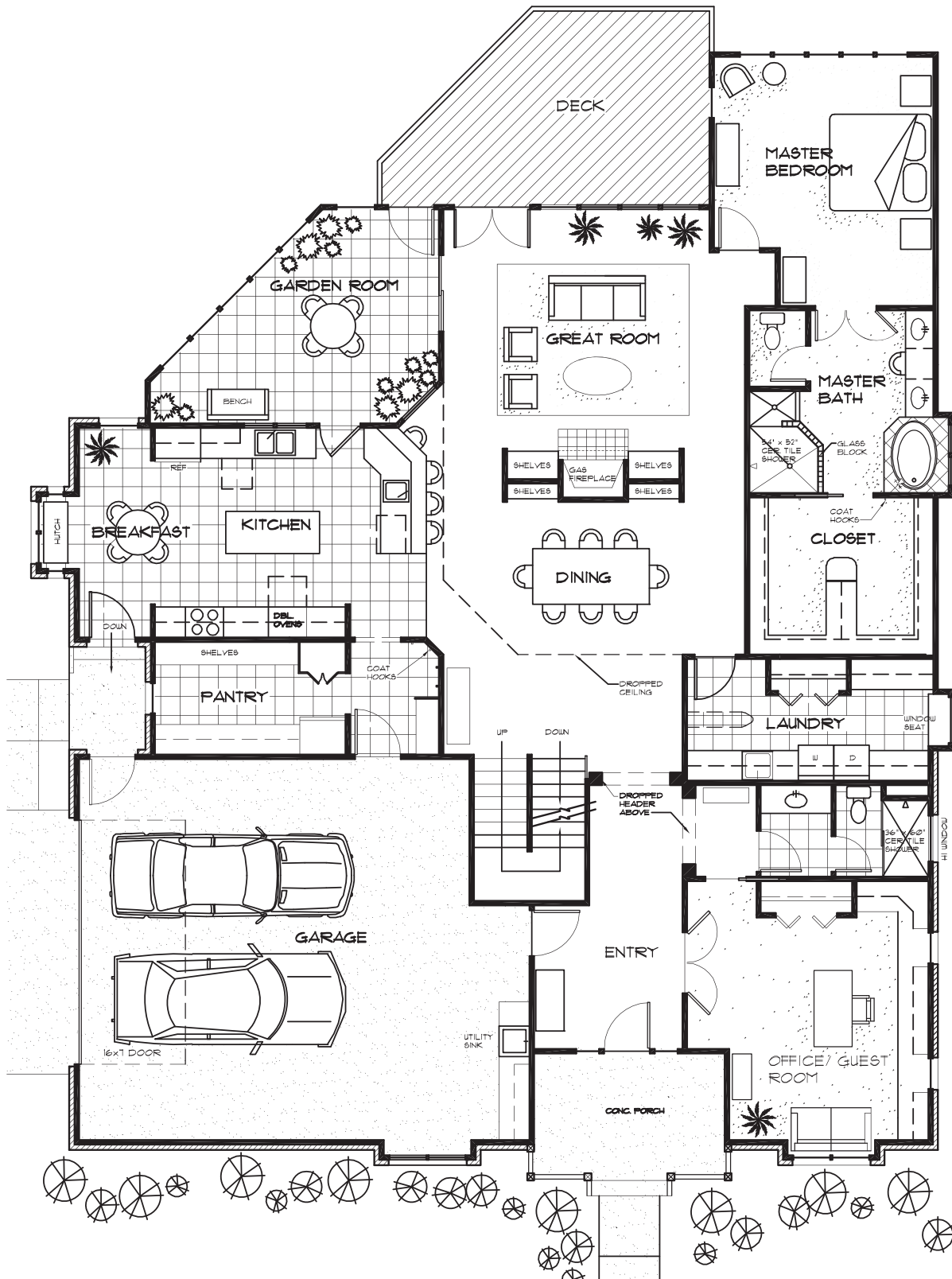


FIGURE 1.7. Design drawings can also show more detail in the form of plan views of a building.

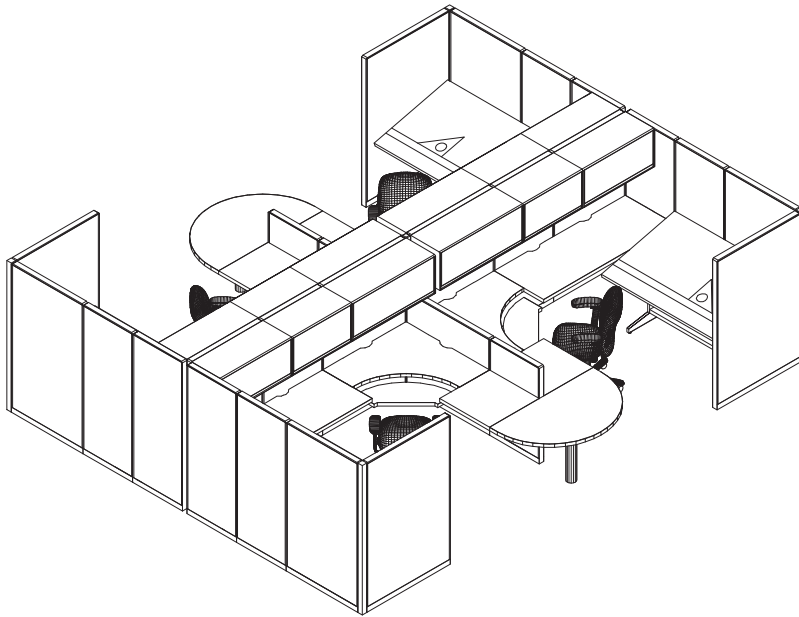


FIGURE 1.8. Design drawings can be done in a variety of techniques, such as this isometric drawing.

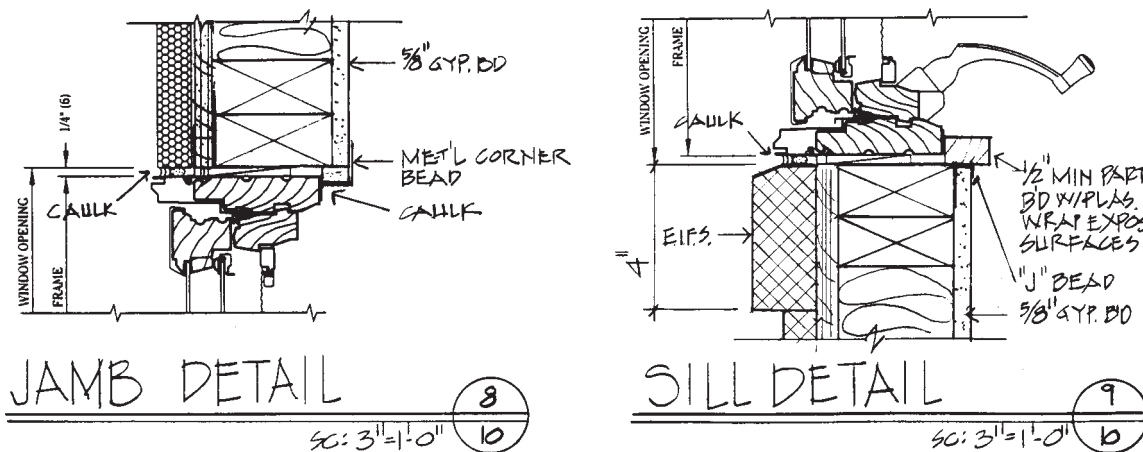


FIGURE 1.9. Drawings used to communicate how something should be constructed are scaled, detailed, and more accurate; they also show materials to be used.

Other issues affecting how interior designers communicate are influenced by universal design concepts, user participation, globalization, sustainability, and digital technology as they apply to design practice within the building industry.

Universal Design

Universal design is a worldwide belief that encompasses the design of environments, objects, and communication with the intent of serving the widest range of users. Universal design should not be used interchangeably with accessible design, which specifically focuses on people with disabilities and their right of access to entities. Universal design is more than providing minimal compliance with set accessibility guidelines and requirements. Universal design integrates accessible features into the design of the building, interiors, and objects for all people of all abilities and ages—including children, the elderly, and those with special needs. It attempts to address usability issues of spaces and equipment as opposed to setting standards and minimum requirements. Figure 1.12 illustrates an example of the international symbol for accessibility regardless of the user's abilities.

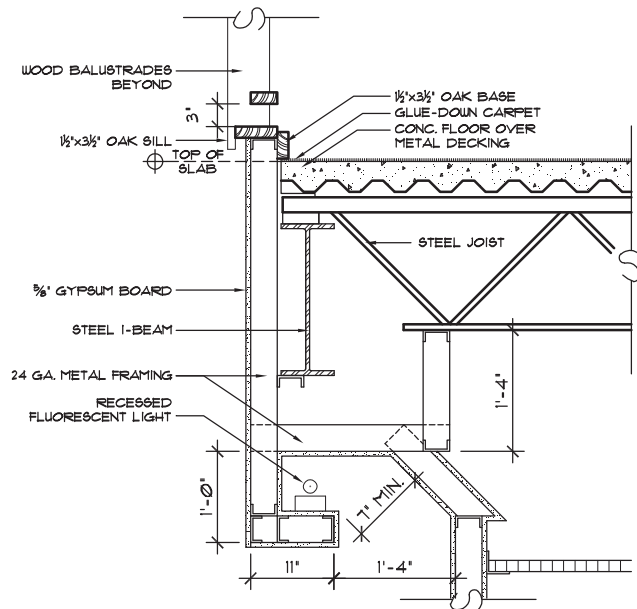


FIGURE 1.10. Designers use graphic conventions to indicate sizes, material, and related information needed to turn ideas for objects or spaces into reality.

SECTION @ BALCONY

SCALE: 1" = 1'-0"

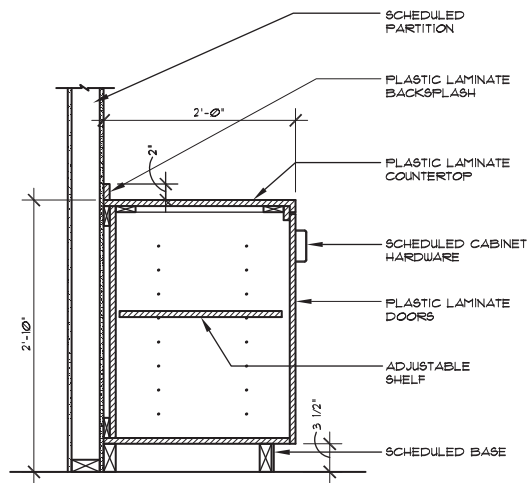
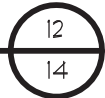


FIGURE 1.11. Clear, concise drawings of an object, such as this section, help a builder to construct the object as the designer envisioned.

SECTION OF BASE CABINET

SCALE: 1" = 1'-0"

The Center for Universal Design at North Carolina State University, in collaboration with a consortium of universal design researchers and practitioners, developed seven principles of universal design that were copyrighted in 1997. Funding for the project was provided by the US Department of Education's National Institute on Disability and Rehabilitation Research. These principles are useful in guiding designers in the creation of environments that are accessible to all people, whether they have a disability. Good examples of universal design are almost invisible, as they are so well blended into the design that they seem commonplace.



FIGURE 1.12. This is the internationally recognized symbol for compliance for wheelchair access.

Seven Principles of Universal Design

PRINCIPLE ONE: Equitable Use

The design is useful and marketable to people with diverse abilities.

Guidelines

- Provide the same means of use for all users: identical whenever possible; equivalent when not.
- Avoid segregating or stigmatizing any users.
- Provisions for privacy, security, and safety should be equally available to all users.
- Make the design appealing to all users.

PRINCIPLE TWO: Flexibility in Use

The design accommodates a wide range of individual preferences and abilities.

Guidelines

- Provide choice in methods of use.
- Accommodate right- or left-handed access and use.
- Facilitate the user's accuracy and precision.
- Provide adaptability to the user's pace.

PRINCIPLE THREE: Simple and Intuitive

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Guidelines

- Eliminate unnecessary complexity.
- Be consistent with user expectations and intuition.
- Accommodate a wide range of literacy and language skills.
- Arrange information consistent with its importance.
- Provide effective prompting and feedback during and after task completion.

PRINCIPLE FOUR: Perceptible Information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Guidelines

- Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- Provide adequate contrast between essential information and its surroundings.

- Maximize “legibility” of essential information.
- Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

PRINCIPLE FIVE: Tolerance for Error

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Guidelines

- Arrange elements to minimize hazards and errors: most used elements; most accessible; hazardous elements eliminated, isolated, or shielded.
- Provide warnings of hazards and errors.
- Provide fail-safe features.
- Discourage unconscious action in tasks that require vigilance.

PRINCIPLE SIX: Low Physical Effort

The design can be used efficiently and comfortably and with a minimum of fatigue.

Guidelines

- Allow user to maintain a neutral body position.
- Use reasonable operating forces.
- Minimize repetitive actions.
- Minimize sustained physical effort.

PRINCIPLE SEVEN: Size and Space for Approach and Use

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user’s body size, posture, or mobility.

Guidelines

- Provide a clear line of sight to important elements for any seated or standing user.
- Make reach to all components comfortable for any seated or standing user.
- Accommodate variations in hand and grip size.
- Provide adequate space for the use of assistive devices or personal assistance.

User Participation

User participation is an important and integral part of the design process as designers seek to be more responsive to their clients’ needs and wants in their interior environments. User participation solicits direct input from the client(s) or users during the design phase of a project. This process is a design tool that makes the client/user an integral part and have a voice in the shaping of their renovated or new building project.

Designers seek user participation by communication directly with the client/users in a face-to-face conference during which the designer can simulate and sketch ideas immediately or use digital devices to compile the ideas in real time. Consumers and clients have become more aware of their environments and products. In turn, designers will continue to search for improved user

participation as they create viable and personally satisfying solutions for the interior environment. Personal digital devices and computer sharing have made the input, collection, organization, and dissemination of client interaction more available and will continue to evolve as a valuable design tool.

Sustainability and Green Certification Programs

The built environment has a profound impact on our natural environment, economy, health, and productivity. Because of this impact, the design, creation, and maintenance of the built environment presents both challenges and opportunities for design professionals. Sustainable design and green design have become common terminology in the design field and involve using methods and products that cause the lowest possible impact upon the ability of the natural environment to maintain its natural balance. Interior designers must practice in an environmentally responsible manner and must advance their knowledge and application of sustainable design in order to advance sustainable practice. One way this can be accomplished is through an understanding of Green Building certification programs. There are many different certification programs to choose from. The following are just a few of the major rating systems currently available to building and interior designers. More detailed information on each of these rating systems can be found on the internet.

LEED

The most recognized sustainable building certification is LEED (Leadership in Energy and Environmental Design) and the Green Building Rating System™, which was developed by the US Green Building Council (Figure 1.13). This system encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. LEED promotes a holistic building approach to sustainability by recognizing performance in key areas of human and environmental health. LEED helps buildings to focus on efficiency and leadership to deliver the triple-bottom-line returns of people, planet, and profit.

LEED v4.1 is the most recent standard for green building design, construction, operations, and performance. LEED v4.1 has eight separate certification programs based on the nature of the project, including ones for new buildings, new interiors, existing buildings and spaces, neighborhood development, cities and communities, residential, recertification, and retail.

These rating systems rate or give credits for standards in eight key areas of human health and environmental sustainability that include location and transportation, sustainable site development, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovations, and regional priority. The rating criteria can vary for each of the rating systems, as well as the facility types. Each rating system is point-based, as credits are given for each green building feature and the number of total points determines whether the building certification is LEED Silver, Gold, or Platinum (the highest level).

Energy Star

Energy Star is offered through the Department of Energy and the Environmental Protection Agency to protect the environment through energy-efficient products and practices. Energy Star scores are based on 1–100 points in operating conditions, regional weather data, and other important considerations. Energy Star scores assesses how a building is performing as a whole: such as its assets, its



FIGURE 1.13. This is the logo for the US Green Building Council, which developed the LEED rating systems.

operations, and how people inside use it. To be certified as Energy Star a building must have a score of 75 points or higher, indicating that it performs better than at least 75 percent of similar buildings nationwide. The certification lasts for one year. Energy Star certified buildings save energy and money and help protect the environment by generating fewer gas emissions than typical buildings.

Energy Star also has a voluntary labeling program for energy-efficient products, such as consumer appliances, residential furnaces and air conditioners, office equipment, lighting, and electronics. To qualify for the Energy Star label, a product must meet energy efficiency requirements established by Energy Star product specifications.

Green Globe

The Green Globe certification program is a green rating assessment and is offered through the Green Building Initiative. Green Globe is a structured assessment of the sustainability performance of a building and ensures energy conservation, lower water consumption, responsible use of materials, and efficient use of project team time. Businesses can monitor improvements and document achievements leading to certification of their enterprises' sustainable operation and management. It consists of three categories, including new construction, existing buildings, and interiors. To qualify, a building must meet at least 35 percent of the program's 1,000 available points. Based on the number of points achieved, a building becomes eligible for certification of one, two, three, or four Green Globes. Green Globe certification program is similar to LEED; however, it requires a third-party onsite assessment, and a postassessment.

BREEAM

BREEAM (the Building Research Establishment Environmental Assessment Method) is an international program that recognizes sustainable buildings and infrastructure projects. BREEAM was first published by the Building Research Establishment (BRE), and is the world's longest established method of assessing, rating, and certifying the sustainability of buildings. It is an assessment undertaken by independent licensed assessors using scientifically based sustainability metrics and indices that cover a range of environmental issues. Its categories evaluate energy and water use, health and well-being, pollution, transport, materials, waste, ecology, and management processes. The certification is based on a star rating system with a designation of "pass," "good," "very good," "excellent," or "outstanding." The categories of BREEAM are on new construction, in-use, or refurbishment projects.

Living Building Challenge

The goal of the Living Building Challenge is to create living buildings that improve the environment rather than just to reduce harm. The Living Building Challenge certification program is based on seven performance areas, referred to as *petals*. The "petals" include place, water, energy, health + happiness, materials, equity, and beauty. Projects must be operational for at least 12 consecutive months prior to assessment to verify compliance. All Living Building Challenge projects must be holistic and must achieve all seven petals to qualify.

National Green Building Standard

The National Green Building Standard is a sustainable building certification from the National Association of Home Builders and is for residential properties only. This includes single-family homes, multifamily properties, and mixed-use developments. Like LEED, it has four different levels of certification, ranging from Bronze to Emerald. It provides independent, third-party verification that a home, apartment building, or land development is designed and built to achieve high performance in six

key areas: Site Design; Resource Efficiency; Water Efficiency; Energy Efficiency; Indoor Environmental Quality; and Building Operation and Maintenance.

GreenGuard

The GreenGuard certification is about air quality and focuses on low-emission building materials, furniture and furnishings, electronic equipment, cleaning and maintenance products, and medical devices for breathing gas pathways. The Underwriters Laboratory's GREENGUARD Certification program is recognized and referenced in numerous building programs, standards and specifications around the world. Products with GREENGUARD Certification or GREENGUARD Gold Certification can contribute to the achievement of points in established green building rating systems, such as LEED, BREEAM, Fitwel, and others. The UL GREENGUARD Certification Program requires that products undergo independent, scientific testing and ongoing monitoring of their chemical emissions. Only products that meet UL Environment's stringent emissions standards qualify for certification.

WELL Building Standard®

The WELL Building Standard® is a performance-based system for measuring, certifying, and monitoring features of the built environment that impact human health and well-being. This is accomplished through seven core concepts, including air, water, nourishment, light, fitness, comfort, and mind. The seven concepts are comprised of 100 features. Every feature is intended to address specific aspects of occupant health, comfort or knowledge. Each feature is divided into parts, which are often tailored to a specific building type. Certification is awarded by the International WELL Building Institute and focuses on the overall impact of buildings on human health and well-being.

Fitwel

Fitwel is a new building certification program to support healthier workplace environments and improve occupant health and productivity. It integrates strategies that optimize health within a building or community and improve the health of employees, visitors, or residents as well as the surrounding community. Fitwel is a building rating system for community and commercial sites, multitenant and single tenant buildings, commercial interior space, retail, and multifamily residential buildings. The rating system addresses the design and operational strategies that enhance buildings by a broad range of health behaviors and risks.

Interior designers, along with architects, real estate professionals, facility managers, engineers, landscape architects, construction managers, lenders, and government officials, are encouraged to use building certification programs to help transform the built environment to sustainability. Federal agencies, as well as state and local governments across the country, are adopting these programs for public-owned and publicly funded buildings. Sustainable considerations within the built environment begin at the design phase of a project and are carried through in the specifications and construction drawings. It is, therefore, important that students in interior design learn how to design and apply certification standards in an environmentally responsible manner. Sustainable issues and certification standards are incorporated into relevant chapters where appropriate.

Globalization

Design has become globalized as firms are getting involved in international projects. Many firms have offices in international countries and designers at those locations. However, with today's technology, offices can be linked through digital methods for sharing project details, files, and daily communication among the various people and cultures involved throughout the world environment. Then, as needs arise, the designers will visit the locales for direct physical involvement.

Technological capabilities assist in collecting and transmitting massive amounts of information that enable designers to share their spatial creations with other firms and their clients on a global scale. However, most international countries work in the metric scale, whereas the United States mostly still uses the US (or English) units of measurement. Because of global involvement, designers may find that they have to do a project using the SI (metric) system of measurements. See Chapter 2 and the metric dimensioning system discussed in Chapter 6.

Digital Technology and Building Information Modeling (BIM)

Digital technology continues to evolve at a rapid pace in the production of new software for two- and three-dimensional modeling programs for use by interior designers and others involved in the building industry. While this book is not about any specific software, there must be some discussion of the most widely used programs and their specific details, as the majority of designers are using computers in the production of design and construction drawings.

Autodesk's AutoCAD® has been one of the most widely used CAD program in interior design and architectural firms in the United States for design and the production of construction drawings. Other popular programs used by the building and design industry include ArchiCAD® (by Graphisoft) and MicroStation (by Bentley). At this point in time, it appears these software programs will not be discarded anytime soon; however, it appears that the architecture and design industry is headed toward the technology known as BIM.

FIGURE 1.14. In this Revit example, multiple drawings and schedules can be viewed simultaneously and revised with the changes automatically done in all views and schedules.
Courtesy of Lisa VanZee.

Autodesk Revit® Building, a BIM technology, is leading a CAD industry standard for interior design and architectural practice. BIM is not a specific program, but an integrated approach to design and construction drawings. It is an approach that produces database-driven, 3-D parametric models of proposed projects that address geometry, spatial relationships, sectional perspectives, unit-cost impacts, and detailed documentation with unprecedented speed. Once mastered, the technology facilitates the entire multidisciplinary interactions of a project team. Revit is available in three different formats:

