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ORTHOGRAPHIC DRAWINGS

Interior design is a multifaceted and ever-changing discipline. The practice of interior design continues to evolve due to technological as well as societal changes.

The sentences above were written roughly ten years ago, in the introduction to the first edition of this book, and continue to hold true today. Digital technology continues to influence and to work as a change agent in the ongoing evolution of design practice. Today's practicing interior designers use software for drafting, three-dimensional modeling programs, digital rendering programs, digital imaging software, as well as a range of word processing, spreadsheet, and presentation programs.

In addition to undergoing constant, rapid technological advancement, the profession of interior design has grown in terms of scope of work, specialization, and the range of design practiced. The growth of the profession, combined with efforts toward development of educational standards, registration, and licensing, have increased its legitimacy as a serious professional discipline.

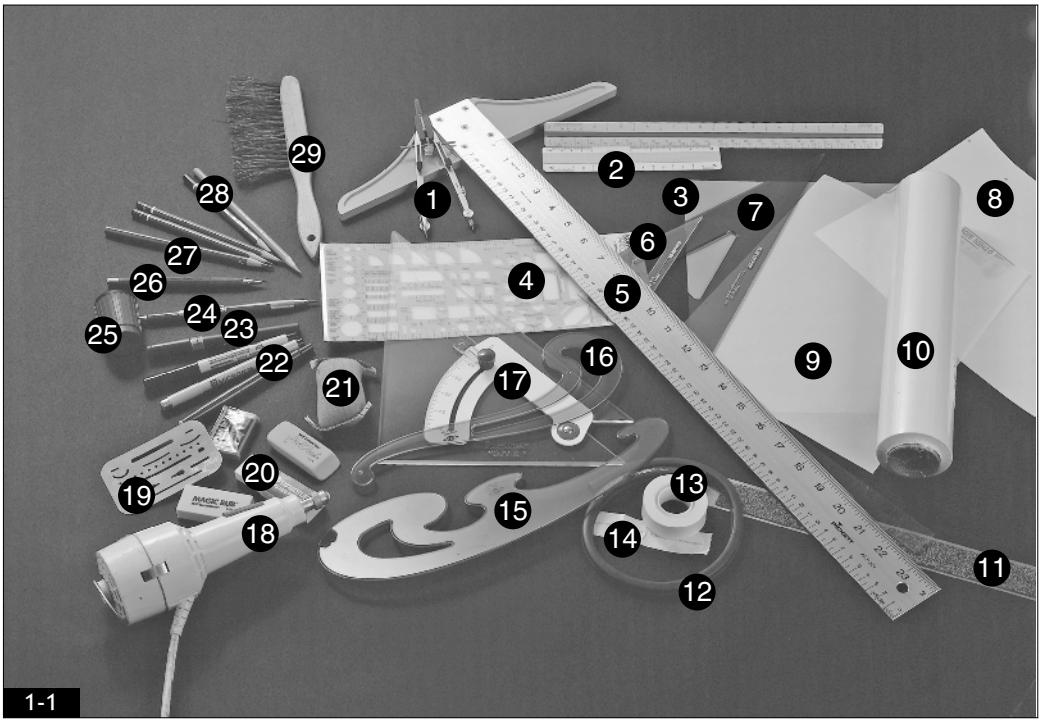
Constant change in society and in one's profession can be overwhelming and a bit frightening, and for that reason it is useful to consider the elements that remain constant in an evolving profession. In many ways, the design process itself remains constant—whether practiced with a stick in the sand, a technical pen, or a powerful computer and software. There are many stories about designers drawing preliminary sketches on cocktail napkins or the backs of paper bags, and these stories lead us to a simple truth.

Professional designers conduct research, take piles of information, inspiration, and hard work, and wrap them all together in what is referred to as the DESIGN PROCESS, to create meaningful and useful environments. A constant and key factor in interior design is the fact that human beings—and other living creatures—occupy and move within interior spaces. To create interior environments, professional designers must engage in a process that involves research, understanding, idea generation, evaluation, and documentation. These are significant constants that exist in a changing world.

For the most part this book covers the process designers engage in and the related presentation techniques used in DESIGN COMMUNICATION. These processes and basic concepts are consistent, whether generated manually or by computer. Some examples included here were created

FIGURE 1-11

1. Compass
2. Architectural scales
3. Drafting film
4. Template
5. T square
6. Lettering triangle
7. Triangle
8. Appliqué film
9. Vellum
10. Tracing paper (roll)
11. Cork-backed ruler
12. Flexible curve
13. Drafting tape
14. Drafting dots
15. French curve
16. French curve
17. Adjustable triangle
18. Electric eraser
19. Eraser shield
20. Erasers
21. Dry-cleaning pad
22. Disposable ink pens
23. Technical pen
24. Lead holder
25. Lead pointer
26. Mechanical pencil
27. Wooden graphite pencils
28. Layout pencils
29. Drafting brush



manually, whereas others were computer generated. Regardless of how drawings and graphics are generated, they are part of a process of discovery, exploration, and creation.

This chapter covers what is often referred to as *drafting*, as well as other forms of two-dimensional graphics; this specific type of drawing is required for all projects that will be constructed. The term DRAFTING refers to measured drawings done with specialized tools and equipment. The truth is that not all drawings used in the process of interior design are drawn with the aid of drafting tools or computers. Often those drawings created in the preliminary stages of the design process are rough sketches and involve little use of drafting tools or equipment. As designs are refined, there is clearly a need for highly accurate, measured, and detailed drawings, and these are drafted with tools.

This chapter presents the materials, equipment, and tools used for manually drafted and freehand design drawings, as well as an overview of the most common drawings used in interior design practice. The information presented in this chapter is meant as an overview, not a definitive drawing or drafting reference. Subsequent chapters cover the other forms of drawings and design graphics used in sketching, and other forms of idea generation.

MATERIALS, TOOLS, AND EQUIPMENT FOR MANUAL DRAFTING

The graphics and drawings used in interior design practice vary, ranging from conceptual sketches and rough layouts to measured technical drawings. The materials, tools, and equipment used to create the variety of drawings and graphics are numerous and ever proliferating. The media and tools selected must be appropriate to the task at hand. This means that their proper selection requires careful consideration of the drawing type and use, as well as an understanding of the available products. Currently most schools and

design firms create the majority of design drawings digitally, using COMPUTER-AIDED DESIGN (CAD) programs. However, some students begin the study of drafting by creating drawings manually; for that reason a description of manual drawing tools and equipment follows. Figure 1-1 illustrates commonly used manual drafting and drawing materials and equipment, which are discussed as follows.

Drawing Surfaces

The type of drawing surface selected directly affects the quality of the drawn image. Some surfaces accept pencil and ink readily and allow for clear, consistent imagery. Transparent papers allow for diazo reproduction (blueprinting) and can be used as an overlay to continue a drawing by transferring details from one sheet to another. Drawings produced on nontransparent surfaces are reproduced by photocopying, digital reproduction (scanning), or photographic processes.

TRACING PAPER is the most common paper surface for sketching in-process design drawings and graphics. Known in various parts of the country as *trace*, *flimsy*, and *bumwad*, this paper is highly transparent and relatively inexpensive. Tracing paper is available in cut sheets and in rolls in a variety of sizes. Rolls of tracing paper work well for interior design drawing because of the varying sizes of drawings required. Tracing paper is available in white, buff, and canary (yellow). Most designers have a personal color preference based on previous experience. Some designers use tracing paper to create actual presentation sketches (used to communicate with a client or end-user) while others use them only for personal exploration.

Because tracing paper is relatively inexpensive, it can be used to develop preliminary sketches and for in-process drawings. This allows for exploration through the creation of many sketches and the generation of many ideas. Tracing paper also works very well overlaid on drawings for transfer and refinement of images. Often many layers of tracing paper are overlaid as a design is refined or as a complicated perspective drawing is constructed. Images on tracing paper can be reproduced easily by being photocopied or being scanned for inclusion in design presentations.

While this is done less commonly in current practice, final design drawings created manually and intended for diazo reproduction are drawn on DRAFTING VELLUM, a transparent paper available in a variety of finishes and weights (thicknesses) and most often white. Drafting vellum should have a high rag or cotton content, giving it a rich finish, strength, and good stability. It is excellent for line work generated with graphite pencils. Good-quality diazo prints can be run from drafting vellum originals. Vellum is also photocopied, scanned, and photographed with excellent results.

In addition to vellum, PLASTIC DRAFTING FILMS are used for final drawings and for some design presentations. Plastic (and polyester) drafting films are expensive, tear resistant, and generally do not react to fluctuations in temperature or humidity (as do many paper surfaces). They accept ink beautifully and allow for easy ink erasure. These films require the use of special pencils. Drafting film originals produce excellent diazo prints and photocopies. For years prior to the use of CAD, plastic film and ink drawings were considered the finest for reproduction.

A range of ART PAPERS is available; the papers are made with a variety of materials and come in many colors, sizes, and finishes. Some of these papers can be used as a drawing surface or as a background or visual element included within a presentation; a range of paper types is discussed in Chapter 5, beginning on page 145.

ADHESIVE REPRODUCTION FILM, also called *appliqué film* and often referred to generically as *sticky back*, is used on vellum or bond drawings. Typed or printed images can be drawn or photocopied onto adhesive reproduction film. The film is then carefully measured and cut and applied to the vellum or bond paper.

Manually generated design drawings can be reproduced on large-format photocopying machines. However, CAD-generated drawings—printed or plotted on bond paper—are the most commonly used in current practice. It is also worth noting that many designers and design firms scan hand drawings and combine them with additional graphics using imaging software such as Photoshop or page layout software such as InDesign® to create digital presentations such as those in discussed in Chapter 5, page 157 (Digital Rendering).

Line- and Mark-Making Implements

Lines and marks record spatial information in interior design drawings and graphics. Control of line thickness and the type of stroke used are important and convey specific information. Thus, the implement used to create lines and marks is a key factor in manually created design drawings.

GRAPHITE is mixed with clay and other elements to produce what are commonly called *lead* pencils. Graphite pencils, used in design drawing, are available in a range of hardnesses based on the mixture of clay to graphite. Graphite pencils and replaceable "leads" are coded with a standard rating system: H stands for hard, B stands for black (the softer leads). The number found next to the H or B refers to the level of hardness. For example, a 6B is softer than a 2B; an 8H is very hard. F-rated leads are at the center of the range, and HB leads are slightly harder than Bs. The softer leads are used in sketching and rendering, whereas H, 2H, and sometimes F leads are most commonly used in drafting.

The graphite described above is used in a variety of mark-making implements. WOODEN DRAWING PENCILS involve a graphite mixture encased in wood and are sharpened like standard wooden writing pencils. MECHANICAL PENCILS are hollow instruments that hold very fine graphite leads. These are sold in a variety of lead widths to create a range of line weights. LEAD HOLDERS are hollow implements that accept thicker leads than mechanical pencils. Although lead holders do not allow for any variety in lead widths, they do accept a range of lead types in terms of softness. Lead holders require the use of a specialized sharpener, known as a LEAD POINTER.

Specialized colored drafting pencils and leads can be used to develop drawings prior to hard-lining them. NONPHOTO-BLUE colored pencils do not reproduce when photographed; however, they sometimes reproduce when photocopied. NONPRINT colored pencils do not reproduce in diazo prints. When appropriate, both types of pencil can be used to lay out drawings prior to completion.

One of the significant advantages of using graphite pencils is the ease of erasing. Harder leads are often the most difficult to erase, whereas soft pencil marks are easily lifted with gray kneaded erasers or pink erasers. Plastic and film erasers can be used to remove marks made with harder leads. A metal ERASER SHIELD is used to protect the drawing surface from unwanted erasing. DRY CLEANING PADS, containing art gum powder that sifts onto drawing surfaces, are available to keep drawings clean.

TECHNICAL PENS have tubular points and refillable ink reservoirs. They are available in a range of point sizes that allow for absolute control of line weight. Because they employ black ink and metal points, technical pens create the finest line work of

any drawing implement. They must be used with the appropriate ink, as specified by the manufacturer.

DISPOSABLE TECHNICAL PENS combine a tubular support with a felt tip and are available in a range of point sizes. These pens require no maintenance or cleaning, making them easy to use. Although disposable pens have been known to skip, causing inconsistent line work, they have improved a great deal recently and are becoming very popular.

FELT-TIP PENS are available in a range of styles and point sizes; they are often used in sketching, exploration, and rendering. Felt-tip pens are not generally used for refined drafted drawings or working drawings.

Erasing ink marks is rather difficult and requires special erasers. Hard plastic erasers can remove ink. However, an ELECTRIC ERASER with the appropriate eraser insert is most useful in removing ink. Electric erasers are very effective but must always be used with an eraser shield. Ink marks on film are erased more easily than those on vellum. Sharp razor blades are sometimes used to scrape ink away from drawing surfaces.

A quality DRAWING BOARD is required for the creation of successful drawings. Serious students must purchase a top-quality drawing board if possible. The board should accommodate a minimum paper size of 24 inches by 36 inches. Drawing boards should be covered with a specialized vinyl drawing surface, sold at drafting and art supply stores. The vinyl surface helps to improve line consistency.

T SQUARES are used in conjunction with the edge of the drawing board to provide an accurate horizontal line or right angle for drawings. PARALLEL RULERS can be attached to drawing boards using a system of screws, cables, and pulleys. This creates the sliding straightedge that is the standard in professional practice. Triangles are used with a T square to create vertical and angled lines. Adjustable and 45/45-degree and 30/60-degree triangles are readily available. Triangles should be fairly clear, easy to see through, and as substantial as possible. An inking triangle with raised edges is required when using ink. It is also useful to have a tiny triangle on hand as an aid in lettering. Triangles should never be used as a cutting edge; this will ruin them. A cork-backed metal ruler is the best edge for cutting.

DRAFTING TAPE or PRECUT DRAFTING DOTS are used to attach drawings to drawing boards. Unlike standard masking and household tape, drafting tape and dots are easy to remove from both the paper and the drawing board. A DRAFTING BRUSH is used to remove eraser debris from the drawing surface.

Measured interior design drawings require the use of a proportional scale. This allows for large areas to be reduced in size to fit on relatively small drawings. An ARCHITECTURAL SCALE is the standard scale ruler used in interior design drawing. In the United States, standard architectural scales employ imperial units, that is feet and inches. Standard architectural scales are marked incrementally with numbers running from left to right, with a number or fraction to the right or left of the incremental lines that indicate scale. For example, in ¼-inch scale the ruler is marked so that each ¼-inch measures 1 foot in scale. Architectural scales have inches marked below the zero marking; these are used to measure elements that are not exact to the foot. In transferring measurements, great care should be taken to record accurate dimensions. Scale rulers should never be used to draw against, as this would result in poorly drawn lines and damaged rulers. More information on the actual scales used for specific types of drawings can be found later in this chapter.

FIGURE 1-2
When an object is enclosed in a glass box, each plane of the box can serve as a picture plane. The view through the top plane (picture plane) creates a plan view, in this case a roof plan.

FIGURE 1-3
The view through the picture plane enclosing the side of the box is called an *elevation*.

FIGURE 1-4
A section is a view of an object with the picture plane slicing neatly through it.

FIGURE 1-5
A floor plan is a view of the building from above with a horizontal plane sliced through it and removed to expose the thickness of the walls.
Figures 1-2 through 1-5 drawn by Ciarah Coenen

An ENGINEER'S or ENGINEERING SCALE is used for measuring larger scale items, typically related to building sites, roads, topographical features and other items such as water and sewer lines. In the United States these scales are based on imperial units—that is feet. These scales are marked incrementally with numbers running from left to right only, with a number given at the left of the incremental lines that indicates scale. These scales measure in parts to the inch, such as 1 inch equals 10 feet, or one inch equals 20 feet and so on up to 60 feet—on standard scales. In using an engineer scale, each value given requires that you multiply the value by 10. For example, using the portion of the scale where 1 inch equals 10 feet; where the 1 is written actually measures 10 feet, and where the 2 is written equals 20 feet. Individual increments marked by small lines along the ruler (without numbers written next to them) represent individual feet—for example, two small line marks to the right of 2 represents 22 feet.

METRIC SCALES are standard throughout most of the world (with the exception of the United States) and represent meters (m) and centimeters (cm) or millimeters (mm). Much like the aforementioned engineer's scale, these scales are based on ratios, such as 1:50, where 1 millimeter would scale to represent 50 millimeters. More information on the actual scales used for specific types of drawings can be found later in this chapter. It is worth noting that the simplified modern version of the metric system is properly called the International System of Units, symbolized by *SI*, according to the U.S. Metric Association; this system includes other units of measurement as well.

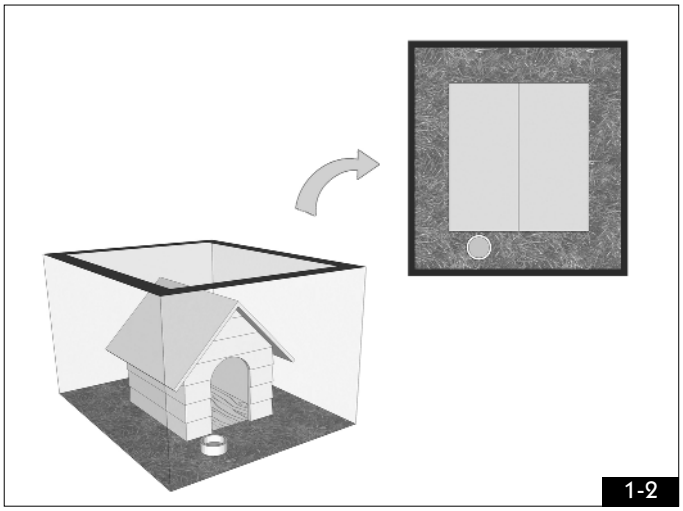
TEMPLATES are most commonly constructed of plastic and are used much like stencils to draw various shapes, including circles, ellipses, furnishings, and fixtures. The more expensive templates—constructed of heavy, durable plastic—are worth the extra money. Furniture and fixture templates work well to quickly lay out and plan spaces. However, in presentation drawings furniture and fixtures drawn from templates can appear artificial and monotonous.

FRENCH CURVES are drawn against as an aid in producing curved lines. FLEXIBLE CURVES, also known as snakes, are also used as an aid in drawing curved lines. These have flexible spines that can be bent to accommodate the desired curve. These also work well for transferring curves from one drawing surface to another. A COMPASS is used for drawing accurate circles and arcs and is useful in situations where a template does not contain a circle of the required size. It is worthwhile to purchase a good compass that adjusts easily and accepts drawing leads and ink heads.

UNDERSTANDING ORTHOGRAPHIC PROJECTION DRAWINGS

The practice of interior design requires the creation and use of various types of drawings. These can be divided into three broad categories based on purpose. The first type of drawing allows the designer to explore ideas (known as *ideation*) and work conceptually, often in the form of sketches. The second type allows the designer to communicate to others, including members of the design team, the client, end users, consultants, and other professionals (presentation drawings). A third type of drawing conveys the technical information required for construction (construction documents or working drawings). This book focuses on the first two types of drawing: those used for exploration and presentation or for graphic communication of ideas.

Unlike ideation sketches, presentation drawings and construction documents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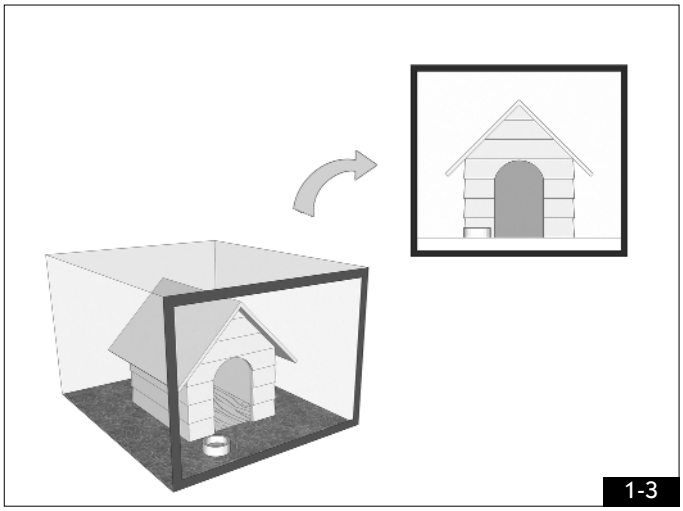
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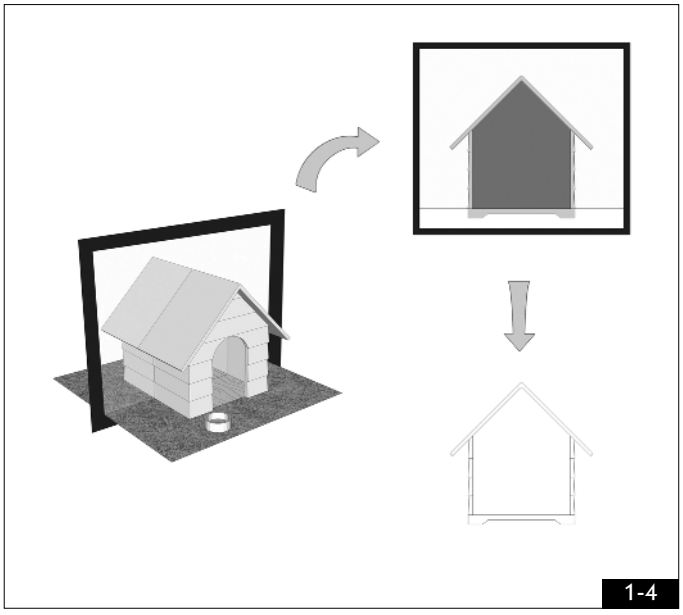
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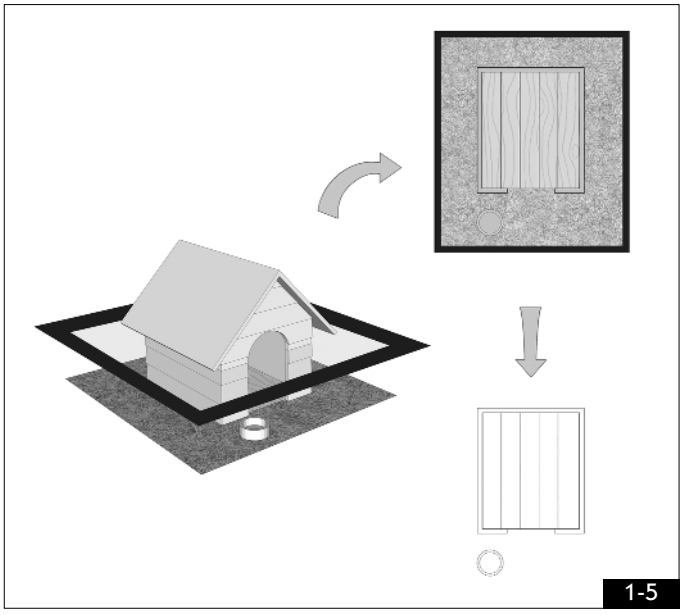

1-5

must use certain standard drawing conventions to clearly communicate and delineate the proposed design; these generally involve drafting in scale. Unlike fine art drawing, design drawing requires adherence to conventions, proportional scale, and accuracy of line. Design drawings are highly standardized so that they carry universal meaning. Or, as one early reviewer of this book put it, "Design drawing is much like a language; the drawings must convey the designer's meaning clearly."

While this publication does not cover them in any detail, highly technical construction drawings are always drafted in scale, either manually or using CAD, and they employ many of the concepts covered in this chapter. They are, however, quite distinct and follow very specific conventions and because of this should be studied in detail by interior design students—toward that end, the References section of this chapter lists two books that describe and illustrate construction drawings clearly for students. Various examples of technical

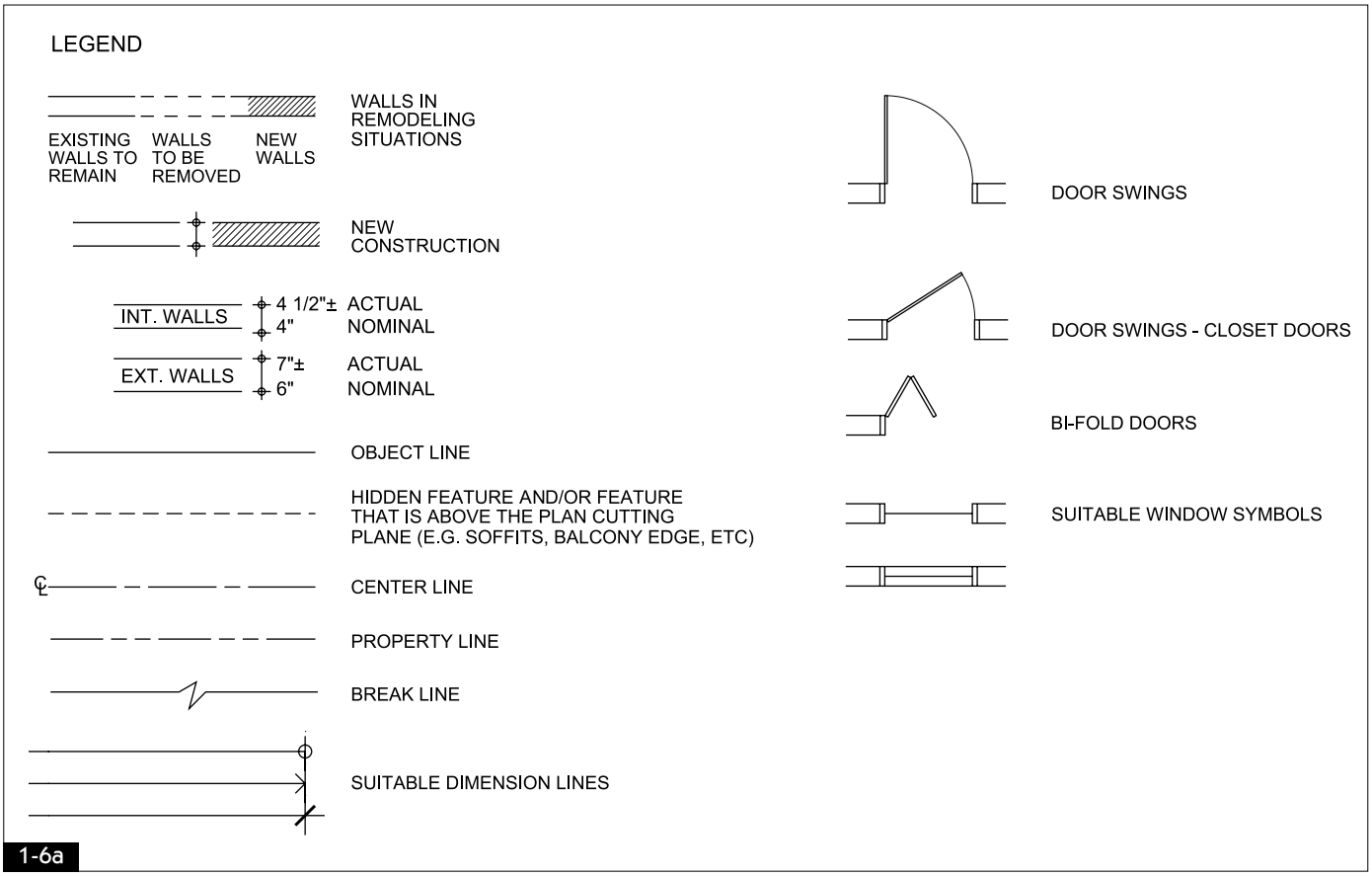


FIGURE 1-6a
Common graphic notations used in orthographic projection drawings.

construction drawings can be found at the end of this chapter in Figures 1-17a through 1-17d and Figures 1-18a through 18-c.

The design drawings most commonly used in scaled delineation of interior environments are *floor plans*, *interior elevations*, *sections*, and *reflected ceiling plans*. These drawings, called ORTHOGRAPHIC PROJECTIONS, are created by projecting information about an object onto an imaginary plane known as the PICTURE PLANE. This direct projection of an object's dimensions allows orthographic projections to retain shape and proportion, making these drawings accurate and precise.

Orthographic projection creates fragmentary views of an object, resulting in the need for multiple drawings. This means that because of their fragmentary nature orthographic projections become parts of a system and are mutually dependent on one another. By their nature, orthographic projections appear flat and lack the three-dimensional quality of perspective drawings. One way to visualize orthographic projection is to imagine an object enclosed in a transparent box. Each transparent plane of the enclosing box serves as the picture plane for that face of the object

The view through the top plane of the enclosing box is called a PLAN. In a plan view only those elements seen when looking directly down at the object are drawn. Figure 1-2 depicts a roof plan.

The views through the picture planes that form the sides of the enclosing box are called ELEVATIONS. Elevations depict only what is visible when viewed directly through the picture plane. Figure 1-3 is an exterior elevation.

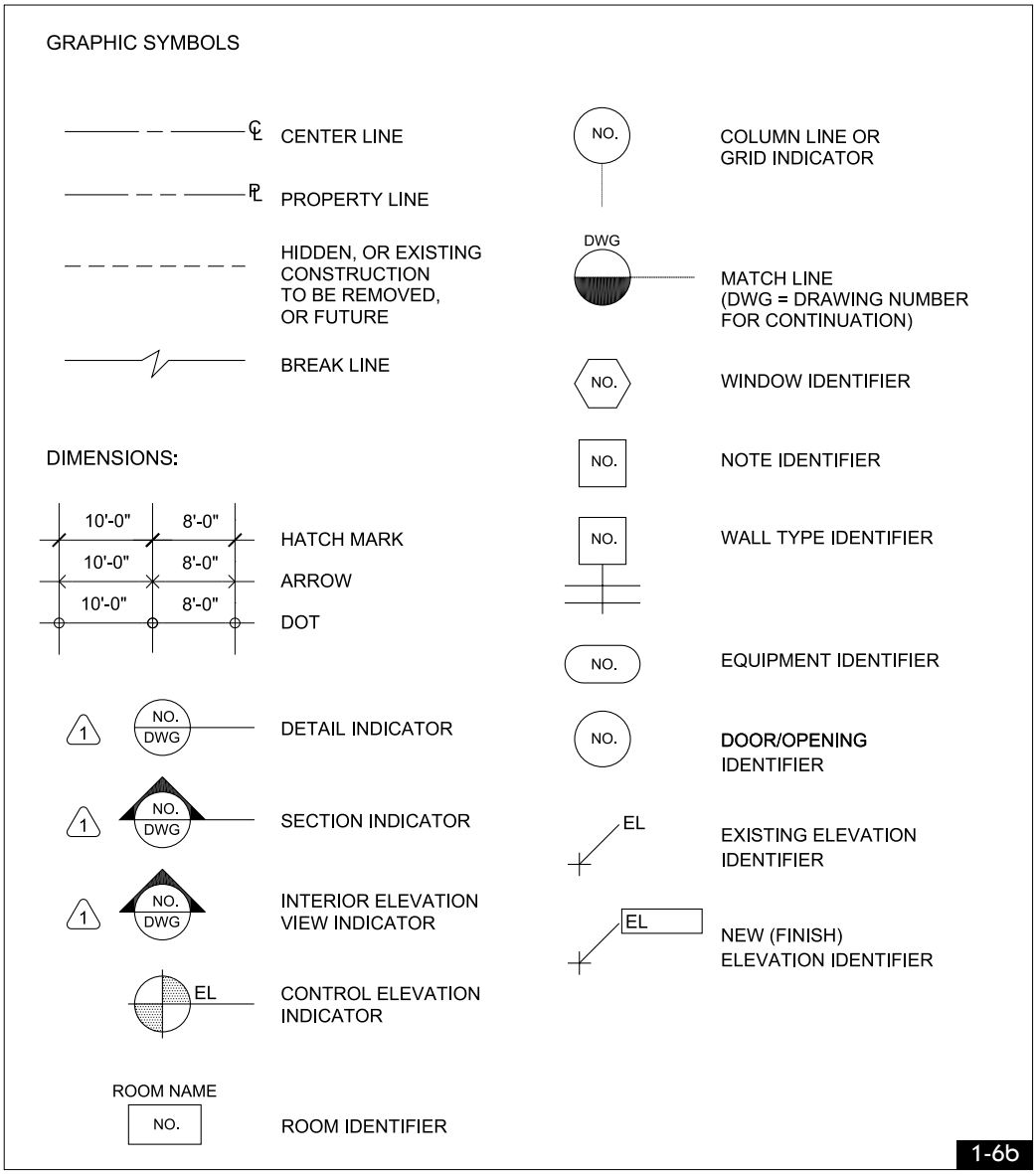


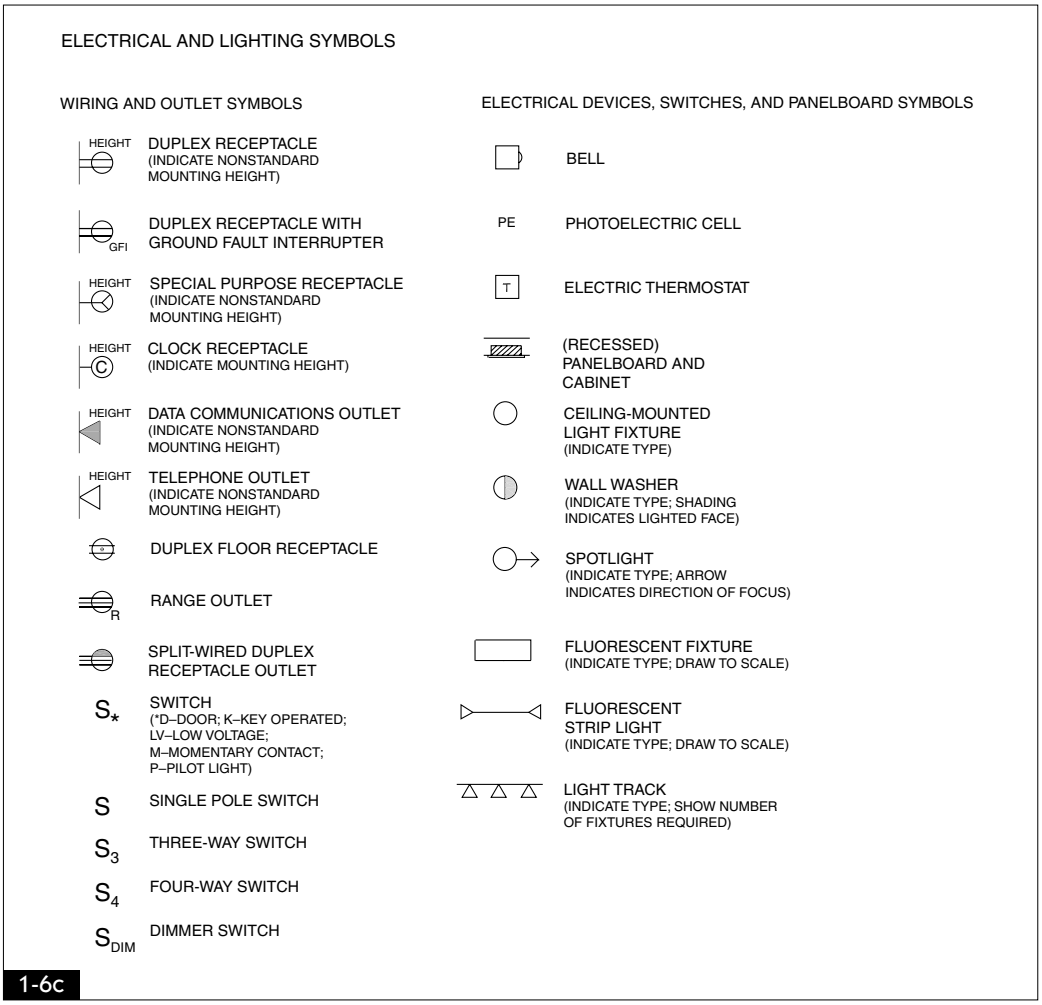
FIGURE 1-6b
Graphic symbols used for references and notes. Items shown with a 1 near them are reference symbols that include a number on top of another number. The number on top refers to the drawing number and the lower number refers to the sheet the drawing may be found on.

A SECTION portrays a view of the object or building with a vertical plane sliced through it and removed. One way of understanding section views is to imagine that a very sharp plane has been inserted into the object or building, cutting neatly into it and revealing the structure and complexity of the object's form (see Figure 1-4).

A FLOOR PLAN, also known as a horizontal section, portrays a view of the building with a horizontal plane sliced through it and removed, exposing the thickness of the walls and the elements below the cut line such as floor finishes and furniture (see Figure 1-5).

Orthographic projection drawings are clearly an abstraction of reality and use specific conventions to delineate space and materials. Unlike some other forms of drawing, orthographic projection drawings require adherence to conventions, proportional scale, and accuracy of line; these design drawings are highly standardized so that they carry universal meaning. Therefore, items such as walls, doors, windows, property boundaries, references to other

FIGURE 1-6c
Graphic symbols used for lighting and electrical information.
Figures 1-6a through 1-6c drawn by Melissa Brewer



drawings and other items are represented by very specific graphic symbols or combinations of lines. Figures 1-6a, 1-6b, and 1-6c illustrate some graphic notations used in these types of drawings such as wall lines, door and window symbols, as well as reference and notation symbols.

ORTHOGRAPHIC PROJECTION DRAWINGS FOR INTERIOR ENVIRONMENTS

The special orthographic projection drawings used in delineation of interior environments are based on the concepts mentioned to this point. These drawings impart information particular to interior construction.

Floor Plans

As stated, floor plans can also be called HORIZONTAL BUILDING SECTIONS, this is because they are drawn as though a horizontal cut has been made in the building (typically between 3 feet 6 inches and 5 feet 6 inches above the floor) as shown in Figure 1-7. Cutting into the building at this location exposes the thickness of walls and other structural elements, and shows windows, doors, and can show floor finishes and furnishings—all of which are located below the location of the cut.

In the United States, floor plans are most often drawn at a scale of ⅛" = 1'0" or ¼" = 1'0", although this varies according to project conditions. Larger-scale floor

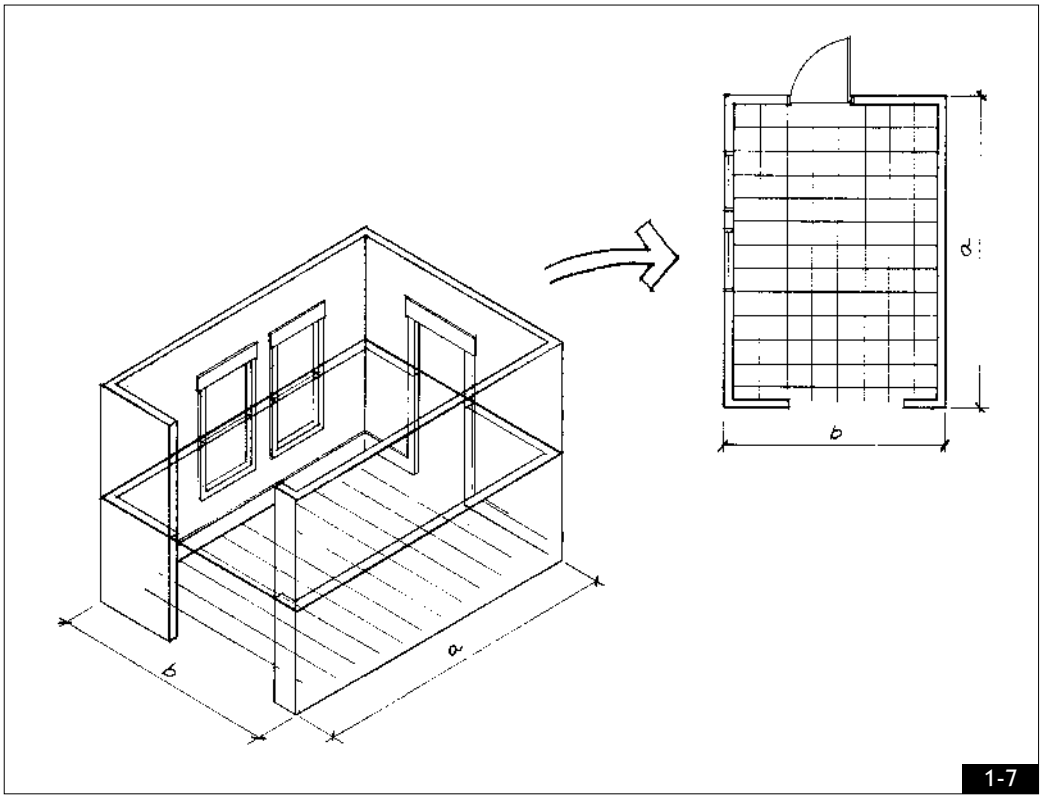


FIGURE 1-7
A floor plan is created when the picture plane cuts through the building horizontally, at 3'6" and 5'6" above floor level.

plans are useful for presentation of complex or highly detailed spaces. Smaller-scale floor plans are required for large projects and are also used as key plans in complex presentations. In creating floor plans using metric measurements, a scale of 1:50 is relatively common; it is somewhat similar to ¼" = 1'0" scale (that would be 1:48 to be exact). Architectural drawings—other than small-scale interior related drawings, such as the floor plans mentioned—are commonly drawn using a metric scale of 1:100.

In drawing floor plans it is important to convey significant spatial relationships with consistent graphic conventions. Various line weights are used to convey depths and qualities of form. In standard floor plans the boldest line weight is used to outline those elements that have been cut through and are closest to the viewer (such as full-height wall lines). An intermediate line weight is employed to outline objects that lie below the plane of the cut but above the floor plane, such as fixtures, built-ins, and furnishings. A finer line weight is used to outline surface treatment of floors and other horizontal planes, such as tile and wood grain. Objects that are hidden, such as shelves, or above the plane of the cut are dashed or ghosted in; this must be done in a manner that is consistent throughout the presentation.

Figures 1-8a and 1-8b are examples of town-house floor plans drawn using AutoCAD software and employing standard conventions and reference symbols. Figures 1-8c is an enlarged portion of the floor plan included to show detailed information.

Standard doors are generally drawn open at 90 degrees to the wall and are often shown with the arc of their swing. The door frame and the space it requires must be considered in the drawing of the door system (this means the dimensions of the frame must be

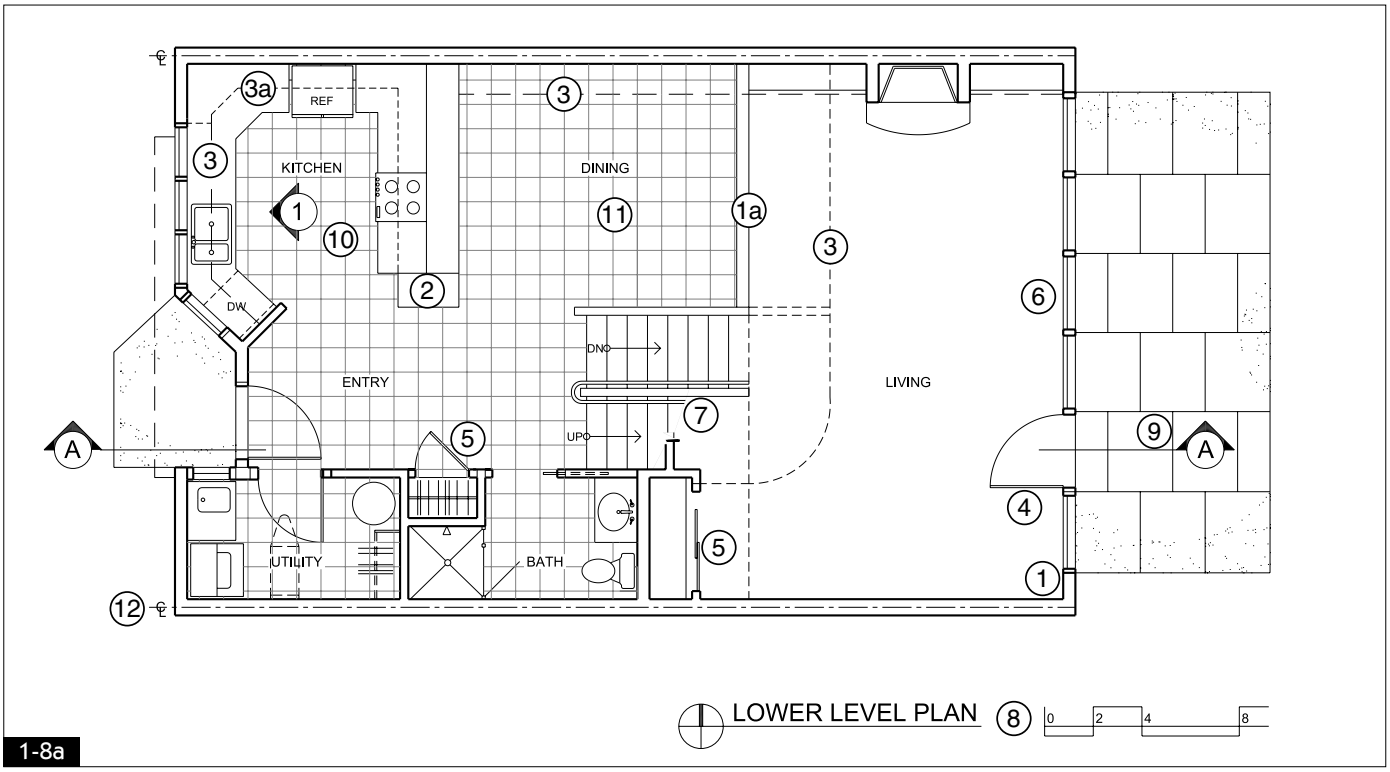


FIGURE 1-8a
Town-house lower-level floor plan employing standard drafting conventions.

1. Boldest lines indicate the location of cut, meaning full-height walls are bold. Lower walls may be shown with lighter line weights (1a).
2. Fixtures, cabinetry, and finish materials are drawn with progressively lighter lines as they recede from the cut location.
3. Elements that are above or below the cut line—such as cabinets (3a) and soffits—or hidden such as dishwashers, are indicated with dashed lines.
4. Standard doors are drawn open at 90 degrees with the arc of swing shown; the full swing can be shown ensure that nothing impedes the full swing of the door.
5. Specialized doors, such as smaller closet doors (shown), bi-fold doors, sliding doors, and pocket doors, are drawn in a way that indicates size and construction.
6. Window glass and sill lines are shown, often with a lighter-weight line than walls.
7. Stairs are drawn as broken off past the line of the cut; a special breakline is used.
8. A title, north arrow, and scale notation are required on all plans. Because this drawing was reduced, a standard written scale was omitted; instead, a graphic scale device is included.
9. This is a section reference symbol. The arrow indicates the direction of the view of the section.
10. This is an elevation reference symbol. The arrow indicates the direction of the elevation view. The number indicates the particular drawing that is referenced.
11. Flooring materials may be shown as required (using a light line weight).
12. This is a centerline, indicating the centerline of the shared wall in the town house.

considered). Doors other than standard such as smaller swinging closet doors, bi-fold, sliding and pocket types are drawn in a manner that is consistent with their construction as shown in Figure 1-6a. Windowsills are typically outlined, often with a lighter line weight at the sill only. Window frames and sheets of glass are shown in various details as scale allows. Stairs are generally shown as broken off past the height of the plane of the cut; this is signified with a special cut or breakline as shown in Figure 1-8a. An arrow should be included to indicate the direction of the stairs from the level of the floor plan, with the word UP or DOWN (DN) adjacent to the directional arrow.

A title, a north arrow, and some type of scale notation should be included on all

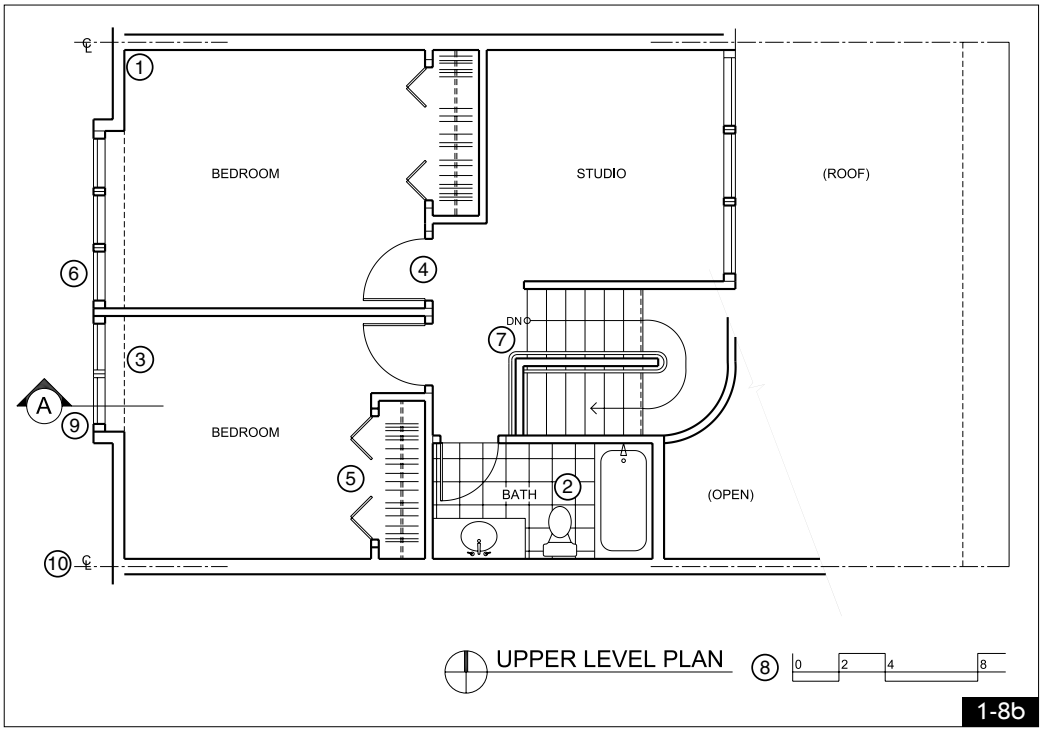


FIGURE 1-8b

1. Boldest lines indicate the location of cut, meaning full-height walls are bold. Lower walls may be shown with lighter line weights (1a).
2. Fixtures, cabinetry, and finish materials are drawn with progressively lighter lines as they recede from the cut location.
3. Elements that are above or below the cut line—such as cabinets (3a) and soffits—or hidden such as dishwashers, are indicated with dashed lines.
4. Standard doors are drawn open at 90 degrees with the arc of swing shown; the full swing can be shown ensure that nothing impedes the full swing of the door.
5. Specialized doors, such as smaller closet doors (shown), bi-fold doors, sliding doors, and pocket doors, are drawn in a way that indicates size and construction.
6. Window glass and sill lines are shown, often with a lighter-weight line than walls.
7. Stairs are drawn as broken off past the line of the cut; stairs from lower floors are shown.
8. A title, north arrow, and scale notation are required on all plans. Because this drawing was reduced, a standard written scale was omitted; instead, a graphic scale device is included.
9. This is a section reference symbol. The arrow indicates the direction of the view of the section.
10. These are elevation reference symbols. The arrow indicates the direction of the view of the elevation.
11. This is a centerline, indicating the centerline of the shared wall in the town house.

floor plans. Scale notation can be stated numerically, for example: ¼" = 1'0". Current practice often requires the use of a graphic scaling device, which allows for reduction, enlargement, and electronic transmission of the drawings.

Symbols relating the floor plan to additional orthographic views or details are often drawn on the floor plan and serve as cross-references.

Successful floor plan presentation drawings require a thorough understanding of drafting conventions. Presentation floor plans may be drawn fastidiously with tools or drawn freehand. Regardless of the style of drawing, presentation floor plans must be accurate and drawn to the appropriate scale so that they communicate the design and can be used by the designer as the project moves forward. Presentation floor plans are enhanced by the use of tone, value, color, and other graphic devices. The graphic enhancement of floor plans is discussed in greater detail in Chapter 5, page 151. Additional examples of plans for commercial projects may be found at the end of this chapter beginning with Figures 1-17a and 1-18a.

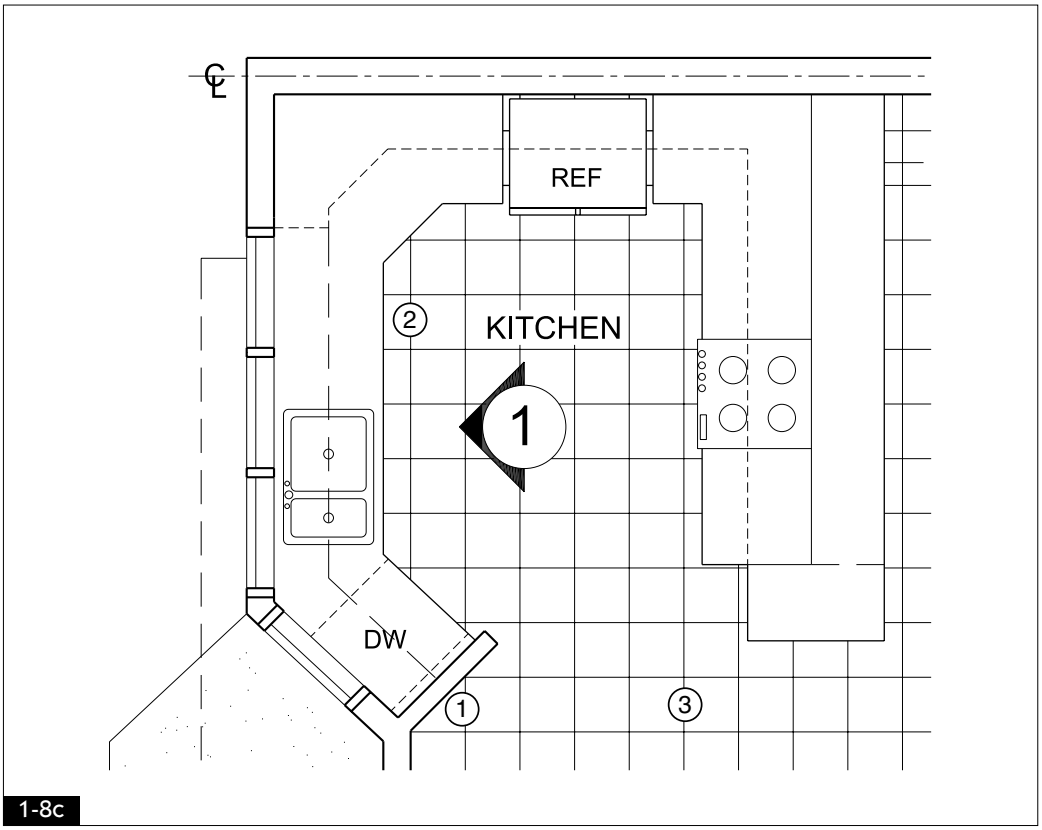
Interior Elevations

Just as exterior elevations are created to reveal exterior elements and features, interior elevations reveal the interior features of a building. One way to understand the creation of interior elevations is to imagine ourselves inside the room we are drawing. Imagine standing inside a room facing one wall directly, with a large sheet of glass (the picture plane) inserted between the viewer and the wall. The interior elevation can then be created by outlining (projecting onto the picture plane) the significant features of the wall. Each wall of the room can be drawn in elevation by means of projecting what is visible as the viewer faces that wall directly as illustrated in Figure 1-9.

Interior elevations are used extensively in professional practice. Successful elevations

FIGURE 1-8c
1. Boldest line
2. Secondary line weights
3. Lighter line weight.

Figures 1-8a to 1-8c design by Courtney Nystuen; drawn by Melissa Brewer



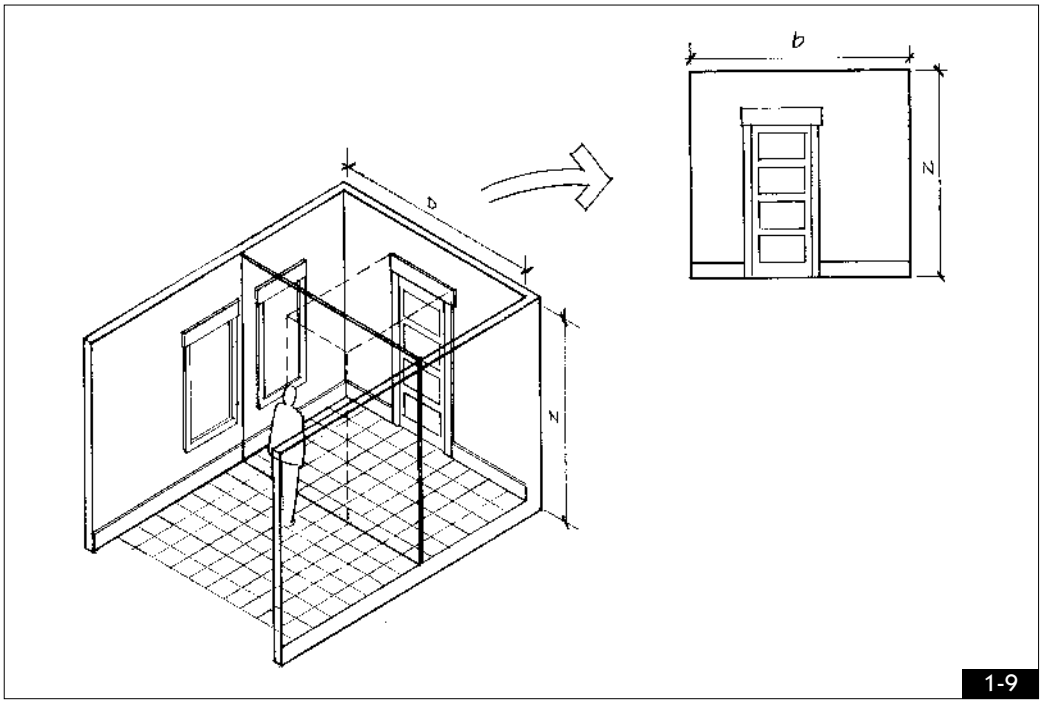
must clearly depict all interior architectural elements in a consistent scale. Interior elevations are typically drawn in a scale ranging from ¼" = 1'0" to 1" = 1'0". Elevations drawn to depict accessories, equipment, cabinetry, fixtures, and design details are often drawn at ⅜" = 1'0" or ½" = 1'0". Millwork and other highly complicated elevations are often drawn at ½" = 1'0" or larger.

All elevations require the use of differing line weights to clearly communicate spatial relationships. Typically, any portion of walls cut through and those closest to the viewer are drawn using a bold line weight. Receding elements become progressively lighter in line weight as they move farther from the picture plane. Some designers draw the line representing the ground line as the boldest, with those lines representing the top and sides of the wall drawn just slightly lighter in weight. Figure 1-10 depicts kitchen elevations for the town-house project.

Drawing interior elevations by hand or digitally can be difficult for beginning students to master and requires a clear understanding of the concepts involved. To this end, a plan and elevations for another project can be found in Appendix 3; additional drawing examples may also be found at the end of this chapter (see Figures 1-17a, 1-17d, 1-18a, and 1-18c).

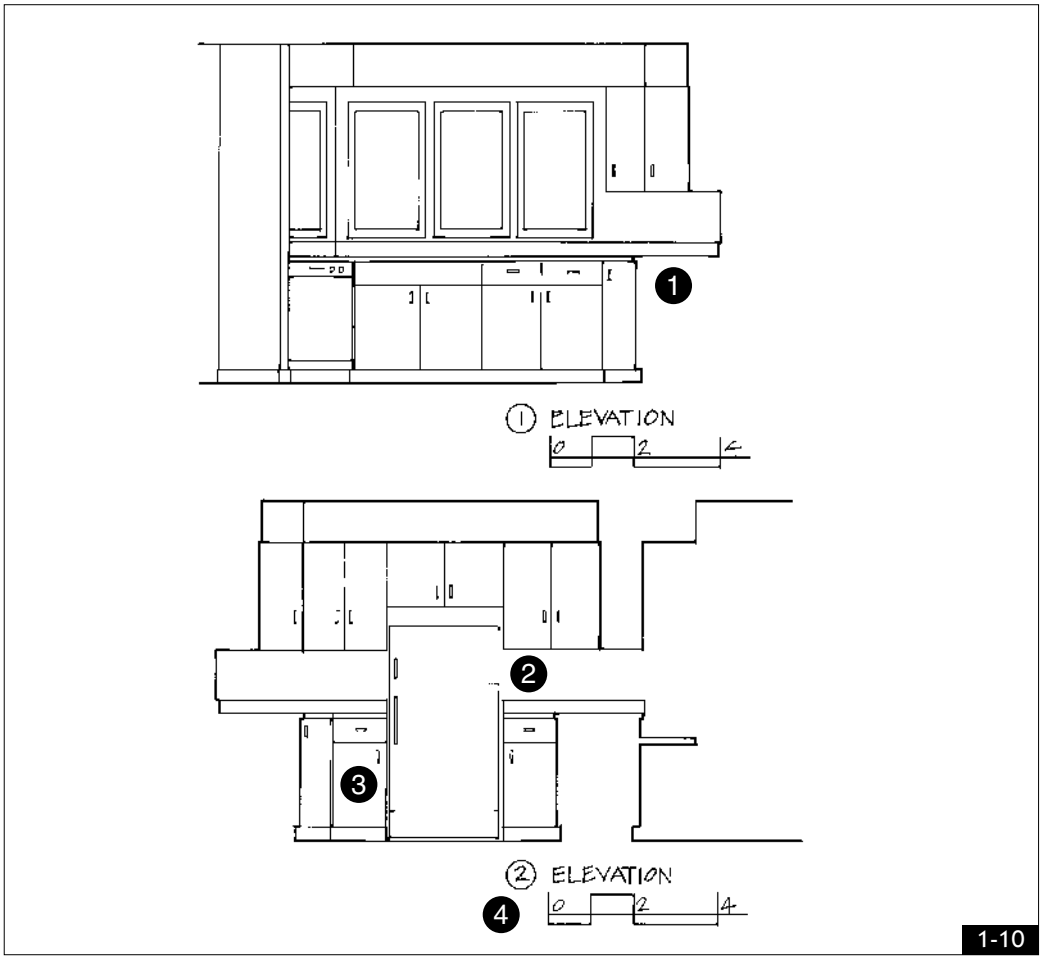
Interior elevations are an excellent vehicle for developing and refining interior details as illustrated by Figures 1-11a and 1-11b, which are interior elevations depicting very different design schemes for the same lobby space.

Like floor plans, elevations used for design presentations vary greatly from those used for construction. Elevations used for construction drawings must necessarily contain significant dimensions as well as appropriate technical information as illustrated at the end of this chapter (see



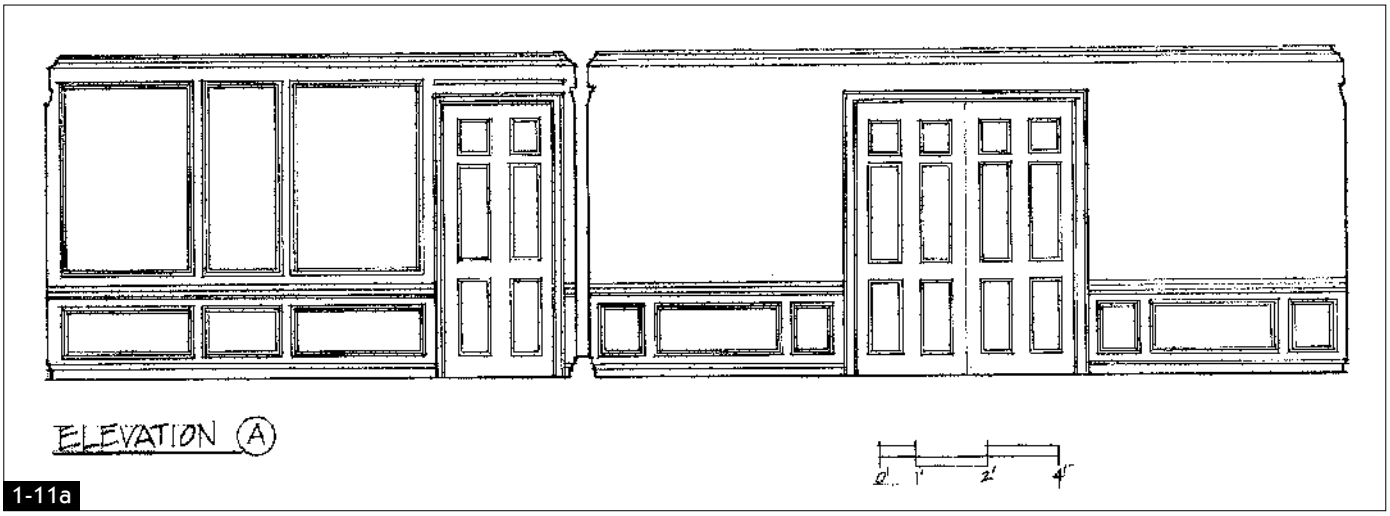
1-9

FIGURE 1-9
In drawing interior elevations, the picture plane is inserted between the viewer and wall(s). What is visible through the picture plane is drawn in elevation.

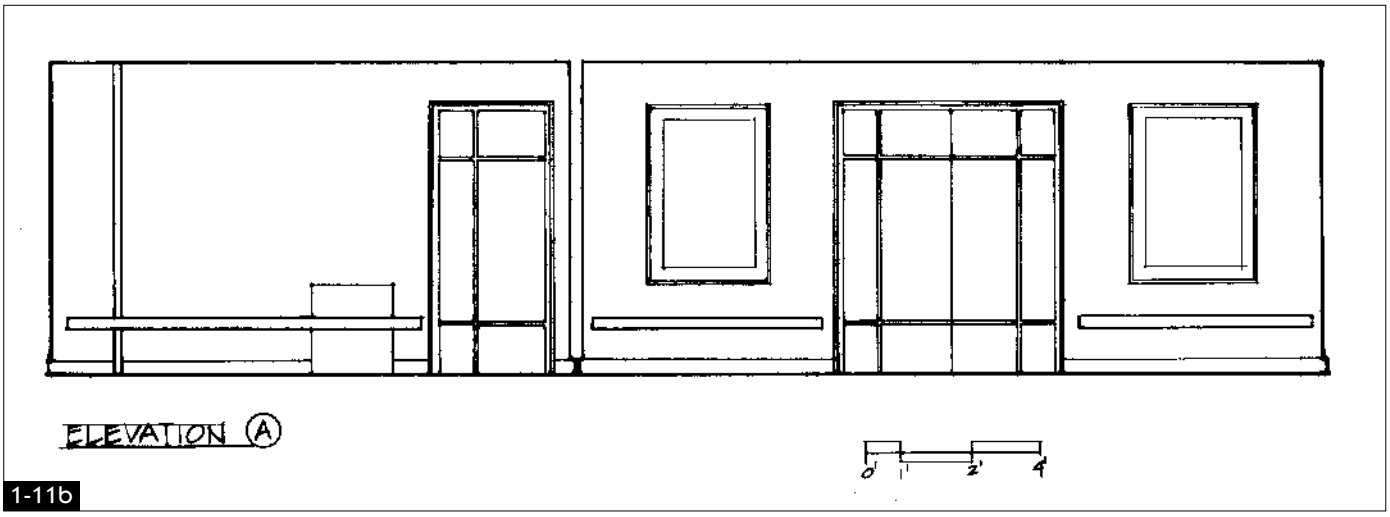


1-10

FIGURE 1-10
1. Portions of walls cut into or closest to viewer are bold.
2. Receding elements are drawn with progressively lighter lines.
3. In elevations including cabinetry and or millwork, details such as countertops, door frames, and hardware should be included.
4. Interior elevations require titles, reference symbols (names or numbers), and scale notation.



1-11a



1-11b

FIGURE 1-11a
This elevation delineates a traditional wood-paneling design treatment for a hotel lobby. Because this drawing was reduced, a graphic scale notation was used in place of written information.

FIGURE 1-11b
This elevation delineates a completely different design approach for the hotel lobby shown in Figure 1-11a. Because this drawing was reduced, a graphic scale notation was used in place of written information.

Figures 1-17d and 1-18c). Those used for presentations can be drawn more freely and often contain less technical information but must be drawn accurately and in consistent scale. Figure 1-12 is a preliminary elevation sketch created to convey design elements for a professionally designed project.

For elevations to work well in visual presentations, they must be clearly keyed, noted, or referenced to the floor plan. Regardless of the referencing method used, titles must be included beneath all elevations and scale should always be noted. Elevations used for presentations are enhanced by the use of tone, value, color, and other graphic devices, many of which are discussed in Chapter 5.

Sections

As described earlier, a building section is a view created as though a vertical plane has cut through the building and been removed. Unlike interior elevations, which depict only what occurs inside the interior; sections can expose the structure of the building. In drawing sections, it is important to include the outline of the structural elements as well as the internal configuration of the interior space. Sections require varied line weights as a means of describing

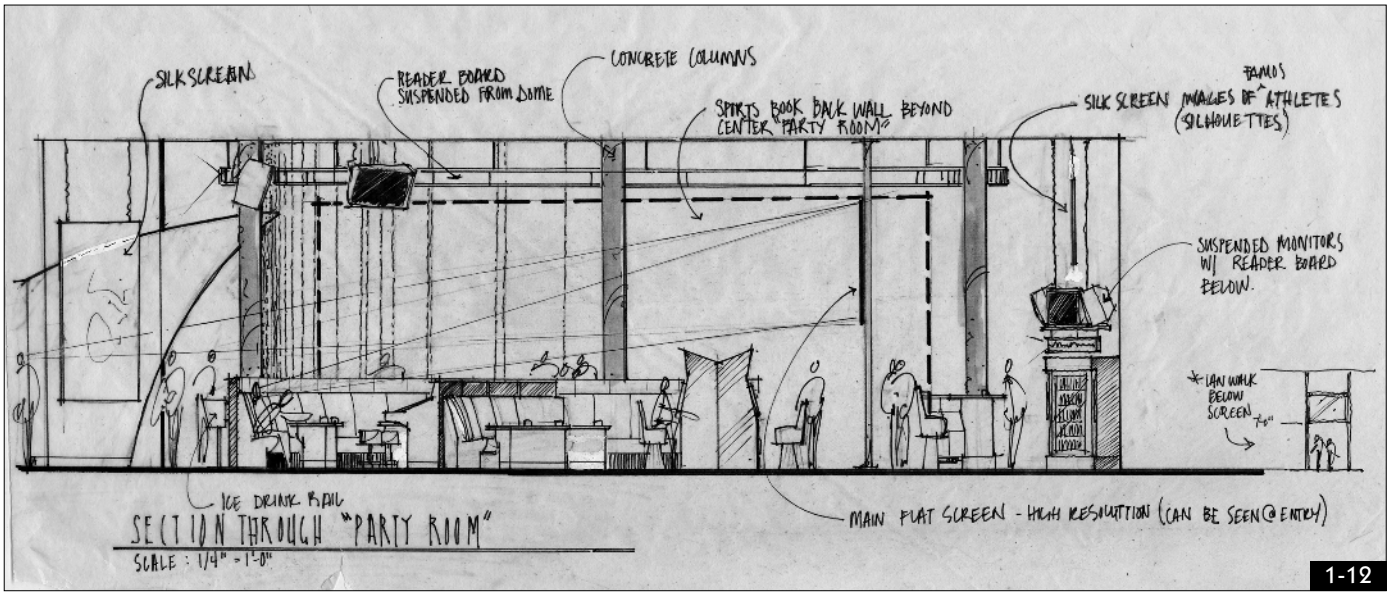


FIGURE 1-12
A preliminary elevation study for a professional project, drawn on tracing paper with markers.
By Cuningham Group Architecture, P.A.

depths and spatial relationships. It is typical to show what is cut through, and therefore closest to the viewer, in the boldest line weight; receding features and details are drawn using progressively lighter line weights.

It is important to consider carefully the most useful location (or locations) of the building to show in section. The section should be cut through the building as a single continuous plane. Sections should expose and convey important interior relationships and details such as doors, windows, changes in floor level, ceiling heights, and, in some cases, finish material locations.

Design and presentation sections differ greatly from construction sections. Construction sections require technical information to communicate information about building systems. In contrast, design sections and presentation sections focus on form, finish materials, and definition of interior space. For sections to work well in visual presentations, they must be clearly keyed, noted, or referenced to the appropriate floor plan. Generally, sections are referenced to the floor plan with use of a symbol that denotes the locations of the vertical cut. Figure 1-13 is an example design section for the town-house project.

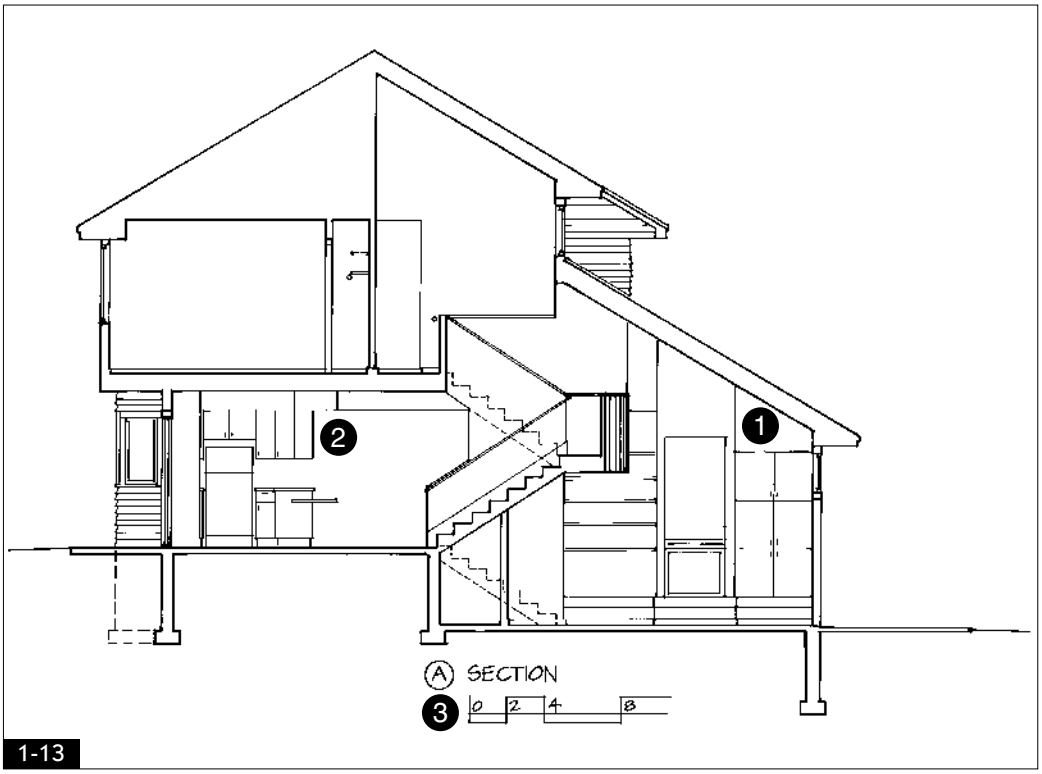
Reflected Ceiling Plans

REFLECTED CEILING PLANS are often used in conjunction with floor plans, elevations, and sections to communicate interior design. Reflected ceiling plans communicate important information about the design of the ceiling, such as materials, layout and locations of light fixtures, items such as sprinklers, diffusers, grilles, and ceiling heights. A reflected ceiling plan is drawn as though a giant mirror were on the floor reflecting the elements located on the ceiling. The use of reflective imagery allows for the ceiling plan to have exactly the same orientation as the floor plan.

There is a distinction between ceiling plans used for presentation and those used for construction. Typically, ceilings plans created for construction are highly technical and include a great deal of information. Reflected ceiling plans used in design presentations can be simplified to include basic ceiling lighting information, ceiling heights, and finish materials as shown in

FIGURE 1-13
Building section for the town-house project.

1. Boldest lines indicate location of cut.
2. Receding elements are drawn with progressively lighter lines.
3. Sections require titles, reference symbols (names or numbers), and scale notation.

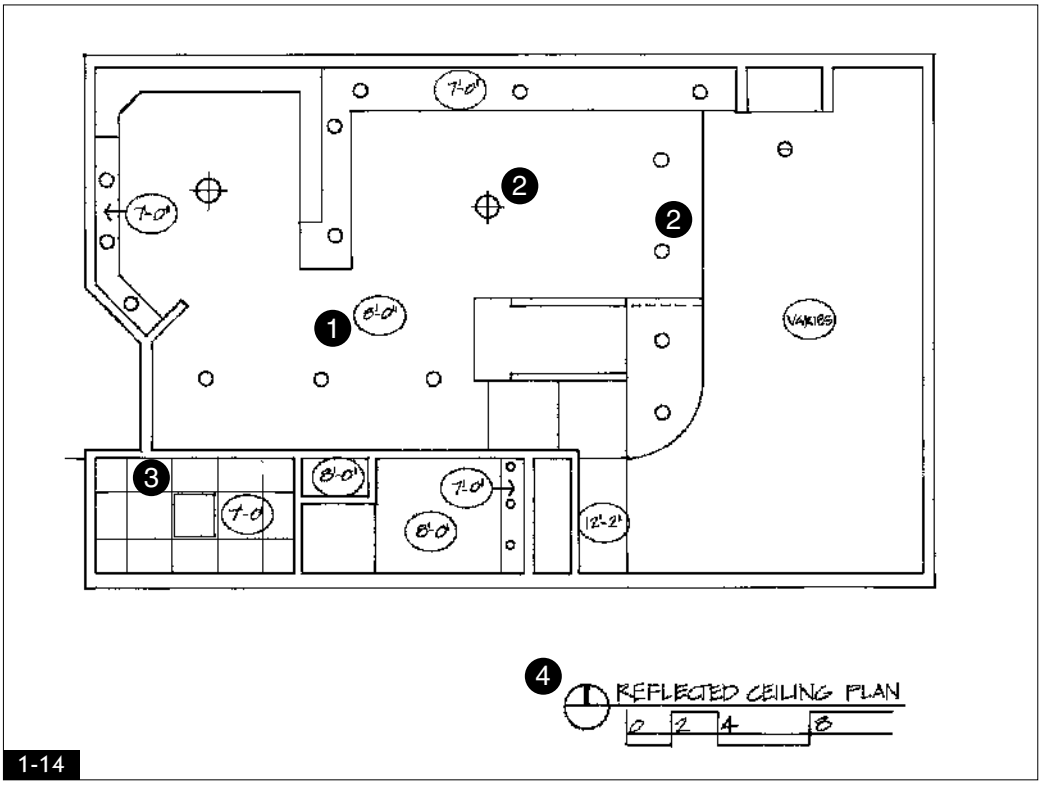


1-13

FIGURE 1-14
Simple reflected ceiling plan for town-house project.

1. Ceiling heights are noted and enclosed in a symbol.
2. Light fixture locations are noted with various symbols and are keyed to a legend.
3. Finish materials such as gypsum board, wood, and ceiling tiles are indicated in scale.
4. Reflected ceiling plans require titles, north arrows, and scale notation.

Note: Reflected ceiling plans require legends (keyed to symbols used); in this example, the legend has been omitted.



1-14

Figure 1-14. Precisely measured, complex technical ceiling plans are required for construction (as illustrated at the end of this chapter in Figure 1-17c).

Together, floor plans, elevations, sections, and ceiling plans communicate information about the quality of an interior environment. Because these drawings are abstracted, fragmented versions of three-dimensional form, they depend on one another to communicate effectively.

The orthographic projections covered in this chapter relate directly to the communication and design of interior space. Differing versions of orthographic projections are used for construction and presentation, but they are used in one form or another on virtually all projects.

Additional types of orthographic drawing are used to communicate the features of buildings and building sites. Site plans, foundation plans, demolition plans, roof plans, framing plans, exterior elevations, wall sections, and design details are also used in the design of buildings. Designers of interior space must be knowledgeable about the nature of these drawings, how they are created, and how they relate to the interior architecture of a building.

Lettering

Traditionally, in the days before CAD, floor plans, elevations, and sections contained notes and dimensions written in a standardized style of hand lettering. However, changes in technology allow for creation of

FIGURE 1-15
Hand-lettering reference.

HAND LETTERING BASICS

HORIZONTAL AND VERTICAL GUIDELINES ARE REQUIRED FOR ACCURATE AND CONSISTENT HAND LETTERING.

USE ALL CAPITAL LETTERS, WITH NO STEMS BELOW OR ABOVE GUIDELINES.

VERTICAL STROKES (STEMS) SHOULD BE PERFECTLY VERTICAL AND NOT SLANTED. USE A SMALL TRIANGLE AS A GUIDE IN CREATING PERFECT VERTICALS.

MOST LETTERS HAVE A SQUARE SHAPE [A] [B] [C] [D] [E]

SPACE BETWEEN LETTERS IS MINIMAL AND IS VISUALLY ASSESSED, NOT MEASURED WITH RULERS.

AN "O" OR "O" SIZE SPACE SHOULD BE LEFT BETWEEN WORDS, LEAVE A SLIGHTLY LARGER SPACE BETWEEN SENTENCES

TYPICALLY VERTICALS ARE THIN WHILE HORIZONTAL STROKES ARE THICK. THIS IS DONE IN PENCIL BY CREATING A CHISEL POINT AND ROLLING THE PENCIL FROM THE THIN TO THICK SIDE.

THE BEGINNING AND END OF EACH LETTER STROKE CAN BE EMPHASIZED TO INCREASE LEGIBILITY. STROKES SHOULD LOOK LIKE THIS! BEGIN END

WHILE INDIVIDUAL LETTERING STYLES VARY, CONSISTENCY MUST BE MAINTAINED WITHIN THE DOCUMENT OR DRAWING.

THE FOLLOWING ARE HAND LETTERING STYLES THAT VARY SLIGHTLY:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1 2 3 4 5 6 7 8 9 10

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1 2 3 4 5 6 7 8 9 10

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 1 2 3 4 5 6 7 8 9 10

1-15

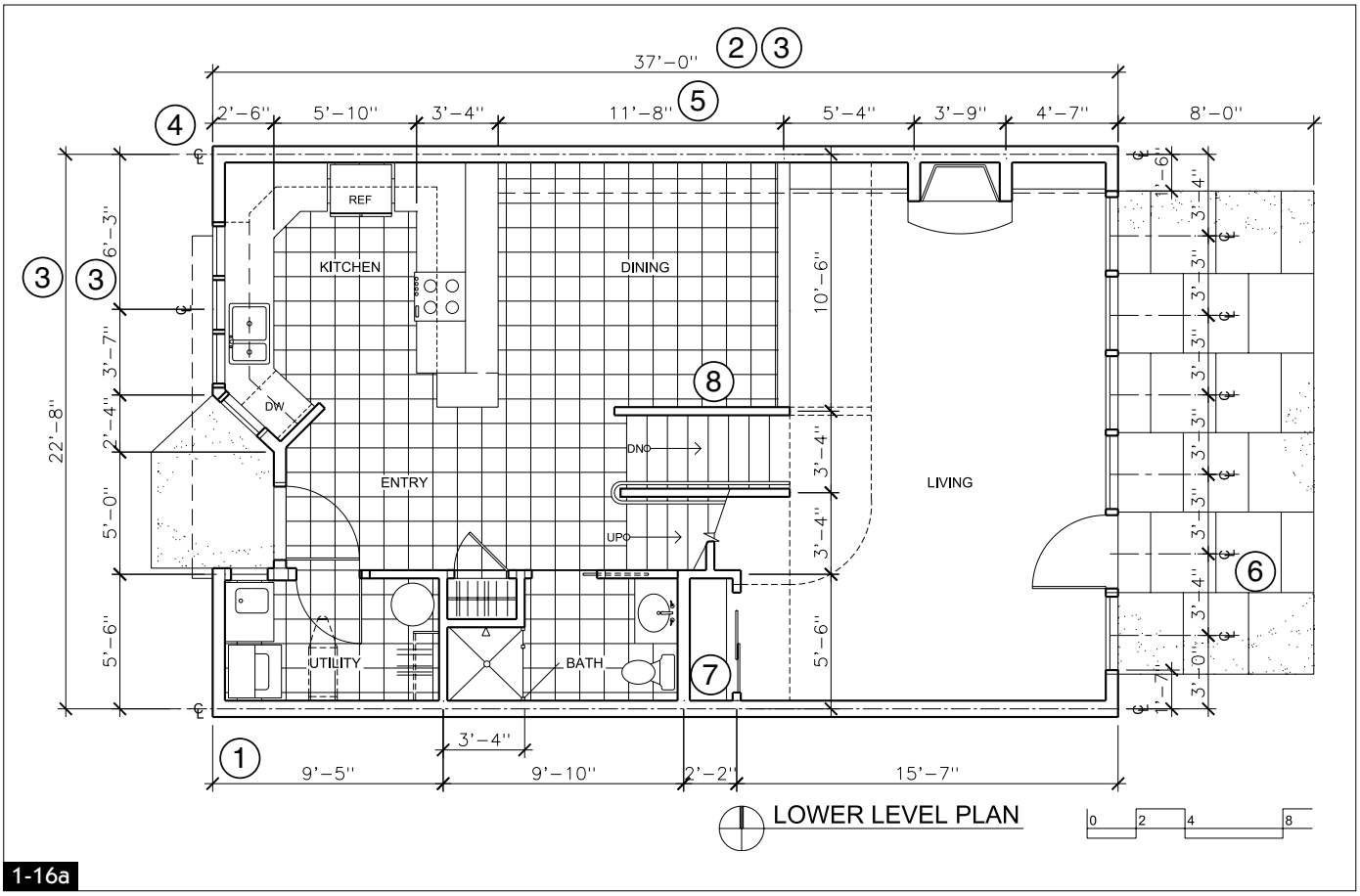


FIGURE 1-16a
Dimensioned lower-level floor plan for town-house project, employing standard conventions for locating interior and exterior dimensions outside of the plan boundaries.

1. Dimension lines and leader lines should be lighter than wall lines or objects measured.
2. Horizontal written dimensions sit above the dimension lines, so they are underlined by the dimension line as shown, or are written in a break in the dimension line.
3. Note location of dimensions: they should not read by rotating the sheet counterclockwise (as in reading from the left side of the sheet) and one absolutely should not have to turn the sheet upside down to read these dimensions.
4. Leader lines run from the building location being dimensioned to the dimension lines. Leader lines should not touch the building; instead, they should be drawn slightly away.
5. Dimensions are written in feet and inches unless less than one foot.
6. Dimensions measured from centerlines must be clearly indicated. Windows are commonly measured to centerlines or rough openings as shown.
7. Exterior walls (and plumbing walls) are shown as nominal 6" thick (actual: 6½" to 7½").
8. Interior walls are shown as nominal 4" thick (actual: 4½" typically).

type that can be applied to hand-drawn orthographic projections. Lettering and type can be computer generated, printed on adhesive reproduction film (sticky back), and applied to drawings and presentation boards. Lettering is also created by specialized machines (lettering machines) that print on adhesive-backed tape that can be applied to drawings. Lettering machines can be used to produce type in a range of sizes, styles, and colors. In addition, all of the commonly used CAD programs allow for consistent, standardized type to be readily applied to the appropriate location on a drawing.

Even with these changes in technology, it is useful to develop the ability to hand-letter in a consistent standardized style. Many designers still create quick sketches,

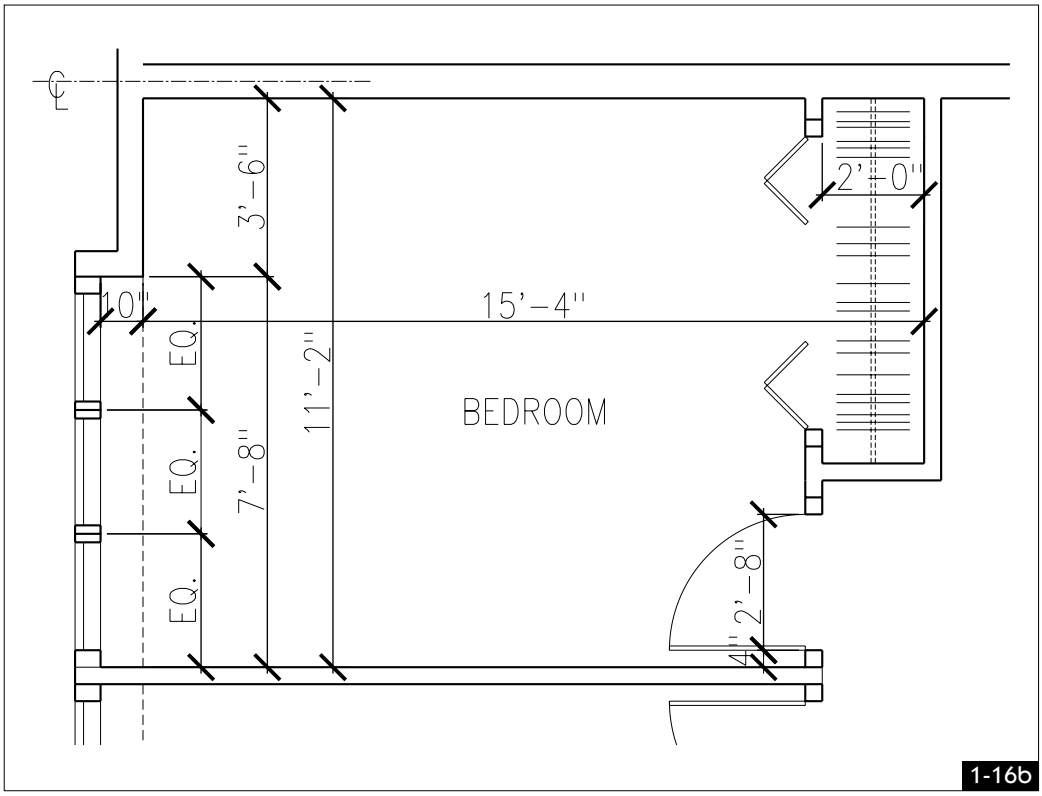


FIGURE 1-16b
Portion of a dimensioned upper-level floor plan for town-house project, delineating conventions for interior "paint to paint" or "finish to finish" dimensions.
Note: This example has dimension numbers and line "tic marks" that are larger than is standard; in this case this was done so that the drawing size could be reduced for publication.
Figures 1-16a through 1-16b design by Courtney Nystuen, drawn by Melissa Brewer

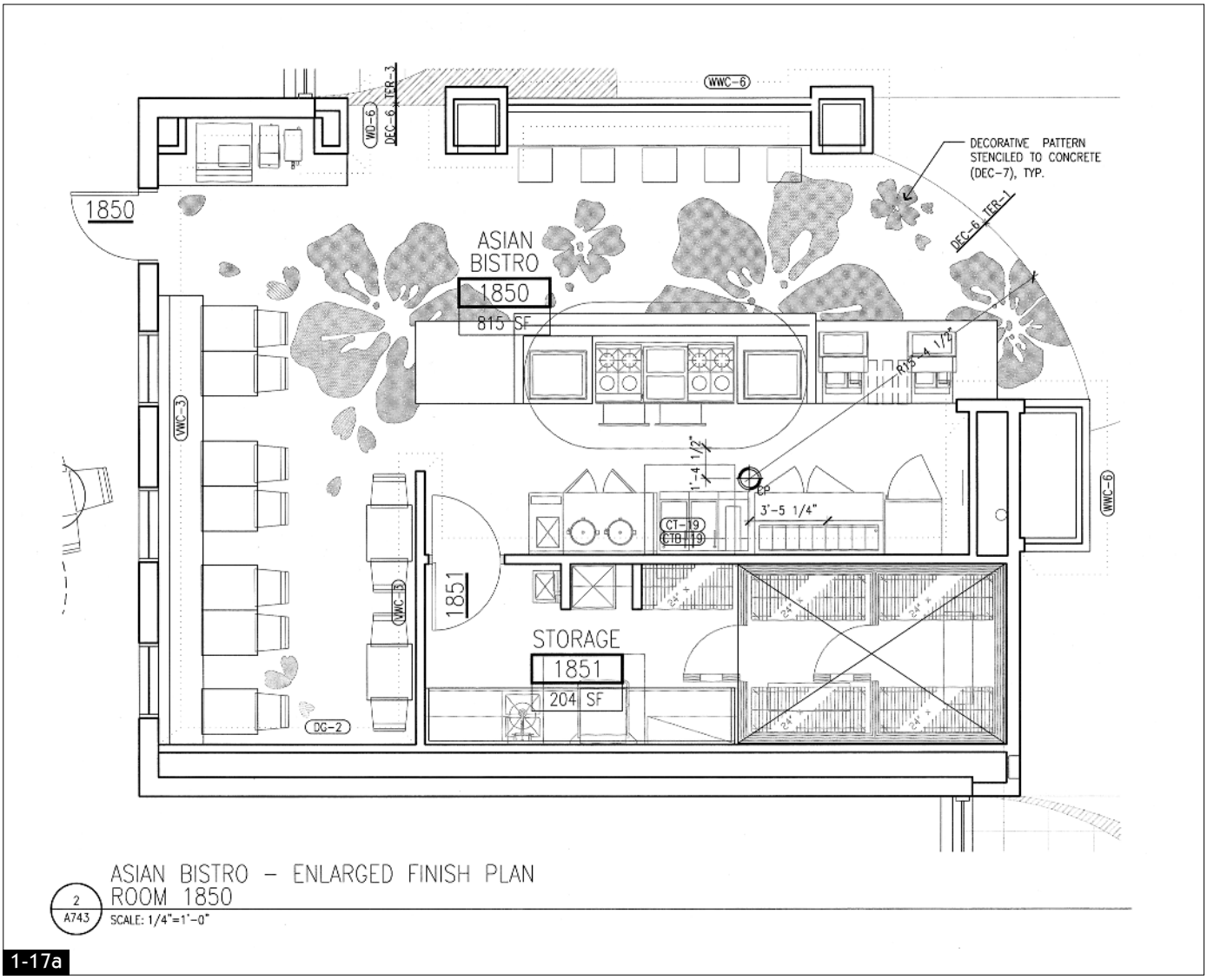
preliminary design details and some presentation drawings by hand, and for the sake of visual consistency, developing skills related to hand lettering is crucial.

There are some basic rules for lettering design drawings, as well as some stylistic elements that influence letterform. Guidelines are required for all lettering locations. Horizontal guidelines create the lines on which the lettering rests. Consistent spacing between the lines of lettering is required. Vertical guidelines must be drawn so that the lines of type are aligned consistently. Lettering for design drawings is typically all capitals, allowing all letters to fit within a single pair of guidelines, with no tips or tails above or below the guidelines. Letters should have perfectly vertical strokes; the vertical strokes should not slant to the left or to the right. A tiny lettering triangle is used as a straightedge in making vertical strokes. Figure 1-15 is a hand-lettering reference.

Dimensions

Dimensions, required on most construction drawings, are sometimes necessary on drawings used for presentation purposes. Their inclusion is based on the project and the presentation audience. When included dimensions must be accurate, complete, readable, and are generally listed in feet and inches; for example *2'4"* is written, rather than *28"*, except for those dimensions that are less than a foot; for example, *11"* (or *0'11"*). Dimensions should be placed on "top" of the dimension line, so that they are "underlined" by the dimension line, and should be placed to as to not require being read by rotating the sheet counterclockwise (reading from left to right) or upside down.

Generally, for standard construction, dimensions and dimension lines are placed outside of the object (such as the building) as shown in Figure 1-16a. In terms of organizing a series of dimensions;



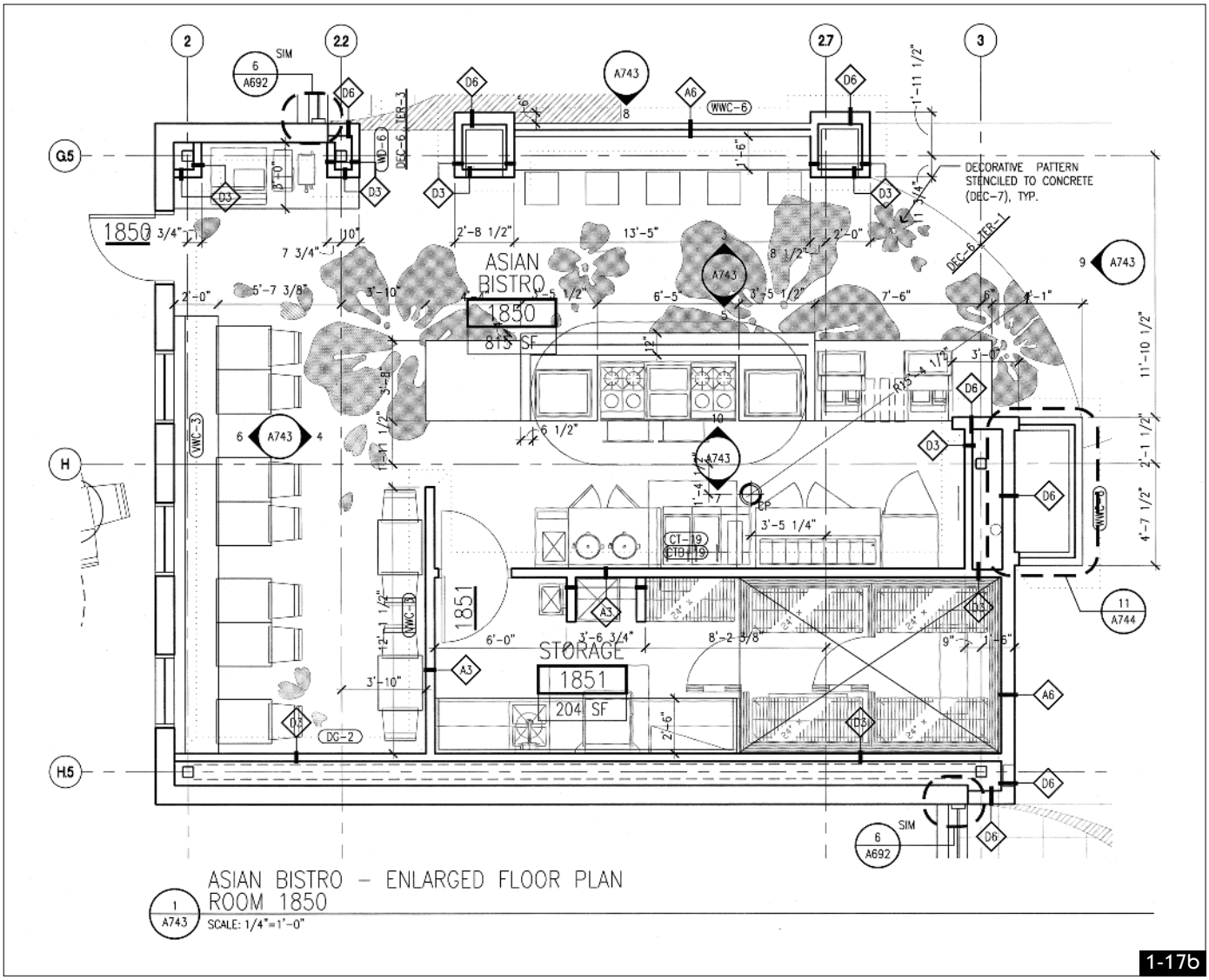
1-17a

FIGURE 1-17a
Floor plan for a professional restaurant design project. This is part of a set of construction documents (Figures 17b through 17d are part of this set).

specific dimensions are placed close to the particular object they are related while the overall distances are placed in the position farthest from the construction (as shown in Figure 1-16a).

Openings such as windows and doors are dimensions to centerlines or to rough frame opening (R.O.); with the exception of masonry openings (M.O.), which are not drawn to centerlines. Another rule of thumb for dimensions is to dimension things once and only once; repetition from one drawing to another can lead to discrepancy errors.

Dimensions typically run from the outside of exterior walls to the centerline of interior walls: where interior tolerances are critical, dimensions can be run from the face of the finished wall to the face of the other finished wall (paint-to-paint so to speak), as shown in Figure 1-16b. This type of dimension can be employed for interior design projects created within existing architecture—for example, when dimensioning walls for an interior renovation of an existing office or retail space, it is common to dimension only the paint-to-paint dimensions rather than exterior to center



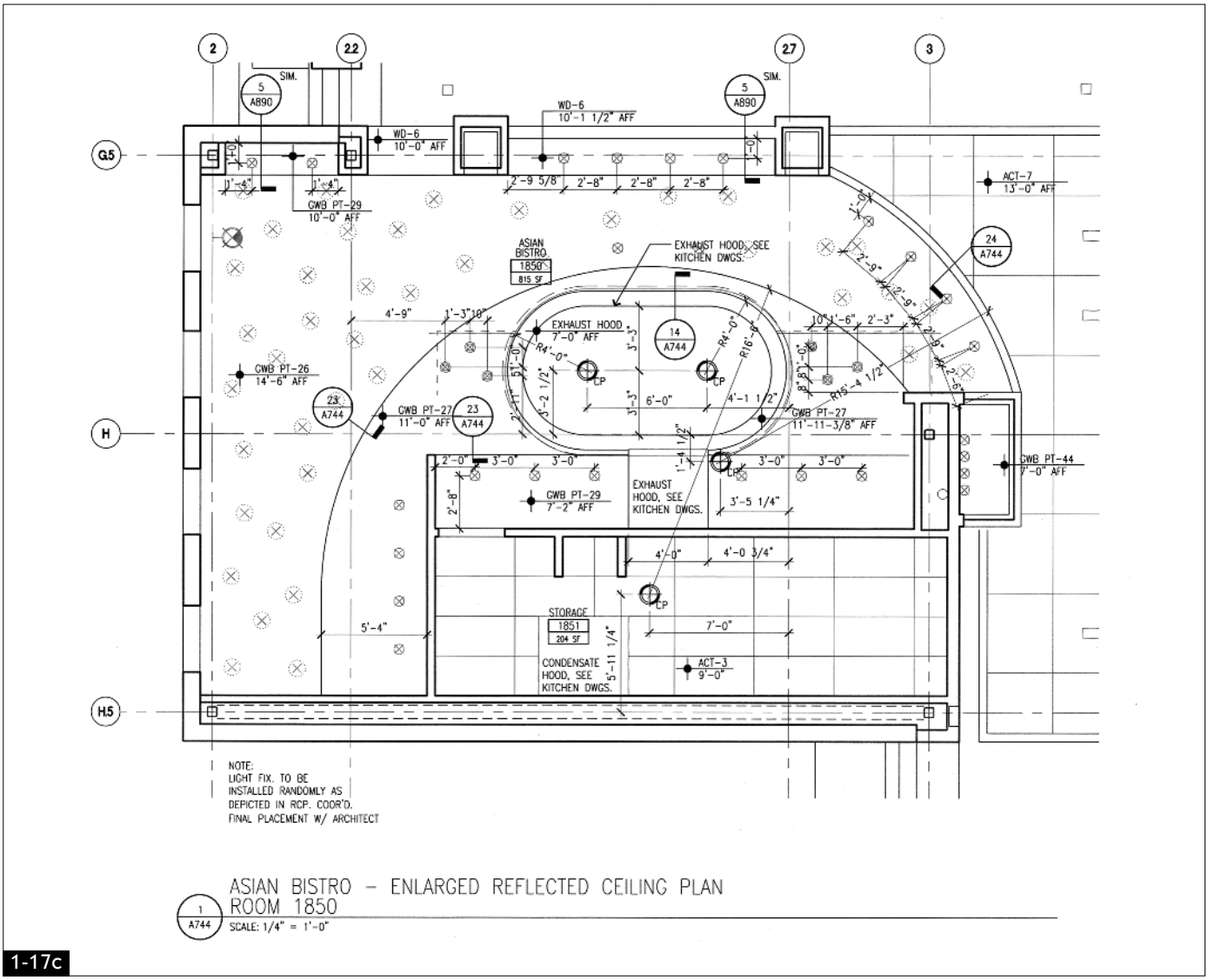
dimensions, as shown in Figure 1-16b. Additional examples of dimensioned drawings can be found at the end of this chapter in Figures 1-17b, 1-17d, 1-18b, and 1-18c.

Computer-Aided Design (CAD): Ongoing Advances

Until very recently, Autodesk's AutoCAD® was the most widely used CAD program in commercial interior design and architectural firms in the United States. AutoCAD is a vector graphics drawing program, in which primitive elements such as lines, polylines, arcs, and text serve as the foundation for more complex objects. Current AutoCAD versions allow for two-dimensional and three-dimensional design and drafting and can serve as a base for industry specific products such as Architectural Desktop®. AutoCAD LT® is a scaled-down, less costly version of AutoCAD, which does not include full three-dimensional drawing capabilities as well as certain presentation graphics, sheet set management, and other elements.

Autodesk Revit® Building software is quickly becoming a new CAD industry

FIGURE 1-17b
A dimensioned floor plan for the project featured in the previous figure.



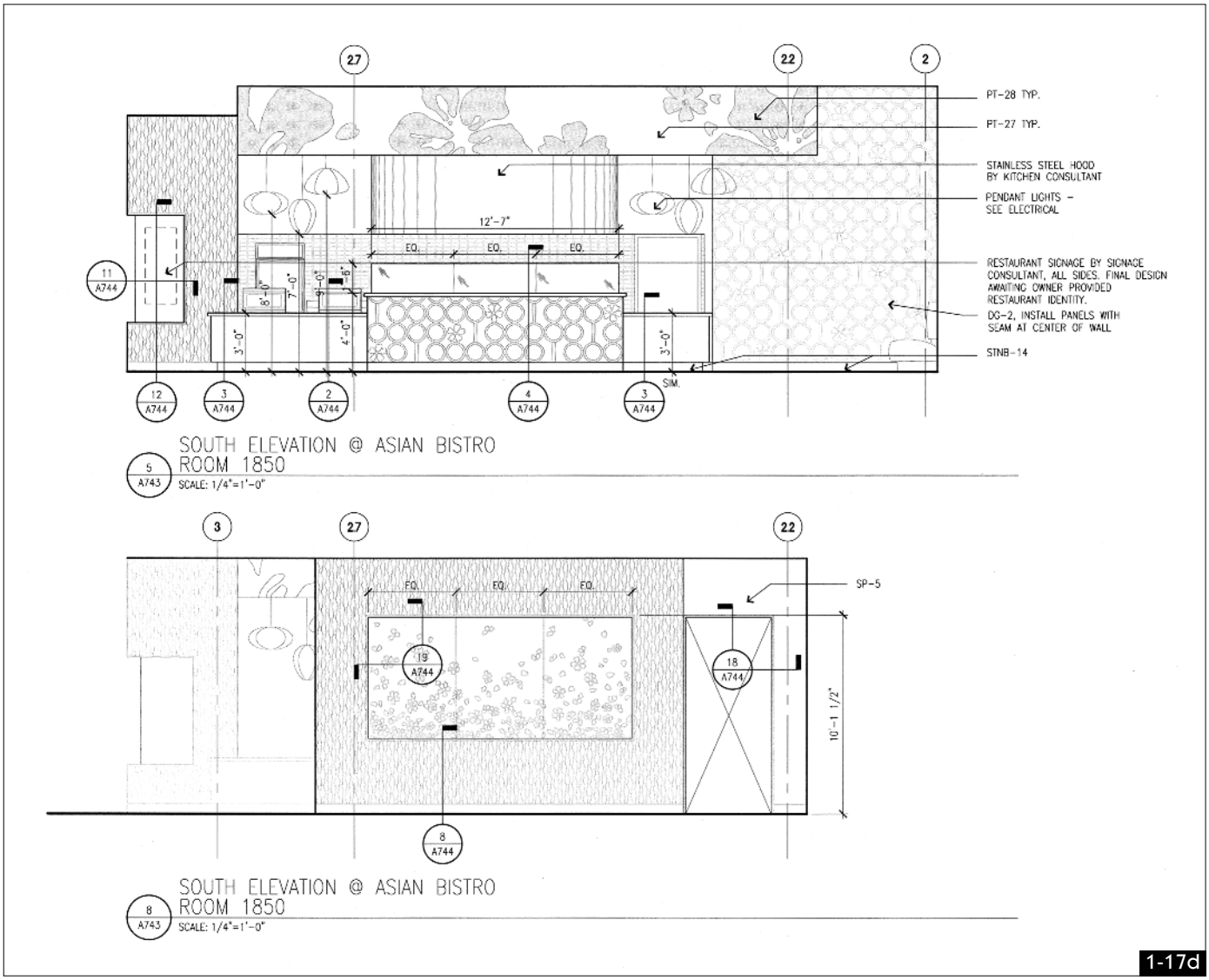
1-17c

FIGURE 1-17c
A reflected ceiling plan for the project featured in the previous figure.

favorite for commercial interior design and architectural practice. Revit is Building Information Modeling (BIM) software that allows for parametric modeling and drafting. An advantage of BIM software is its ability to create coordinated, consistent, computable information about a building project. This means that changes made in one view are automatically integrated into related drawings and schedules. In contrast to AutoCAD, which at this time requires that drawings are "X-referenced" for this to occur.

Other types of CAD software used by design firms throughout the world include MicroStation (owned by Bentley), which generates two-dimensional and three-dimensional vector graphic objects and elements. ArchiCAD® (owned by Graphisoft) is also used in architectural, facilities management, and interior design practice and employs "smart," data-enhanced, parametric objects; these in turn help to create the basic structure and elements that come together to create the building.

Designers and sales professionals specializing in kitchen and bath design as well as those involved in residential design and furniture sales use a software program



called 20-20 Design. This software allows for two-dimensional drawing and planning as well as the generation of three-dimensional views that can be used for client presentations and can incorporate manufacturers' specific product information into drawings.

There are a number of software programs used specifically for three-dimensional modeling and rendering; some of these are discussed in Chapter 4, page 133.

Clearly, things continue to evolve in terms of software and hardware used in design and design presentations. With that said, it is important to note that the conceptual basis for orthographic drawings and drafting conventions is the same whether created by hand or through the use of electronic tools. The meaning communicated in a floor plan is the same whether the drawing is created by hand or with the use of any within a range of CAD programs and for that reason this book covers the concepts behind the drawings rather than supplying detailed information about the software used to create them.

FIGURE 1-17d
Elevations for the project featured in the previous figure.
Figures 1-17a through 1-17d by Cuningham Group Architecture, P.A.

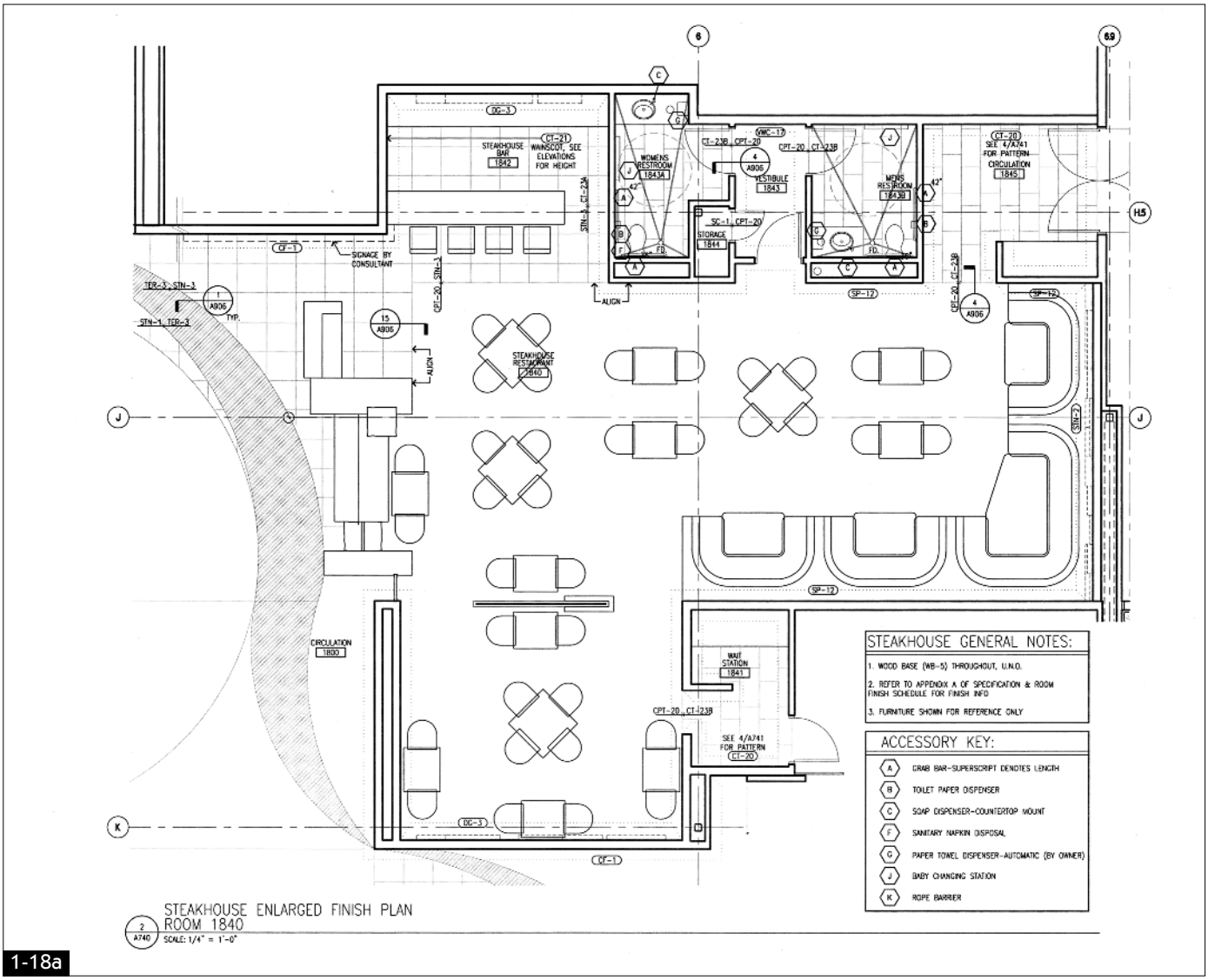


FIGURE 1-18a
Floor plan for a professional restaurant design project. This is part of a set of construction documents (Figures 18b and 18c are included in this set).

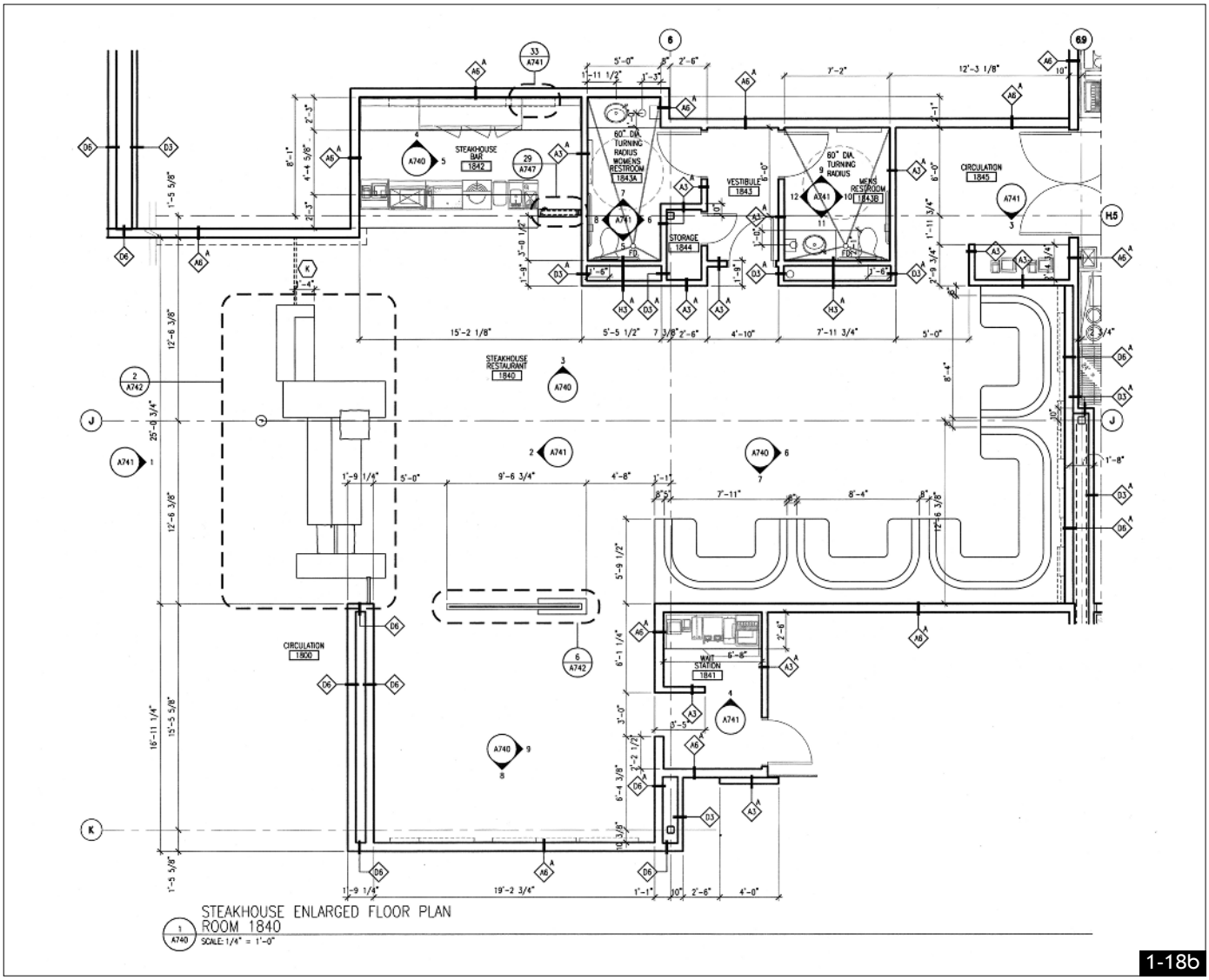


FIGURE 1-18b
A dimensioned floor plan for the project featured in the previous figure.

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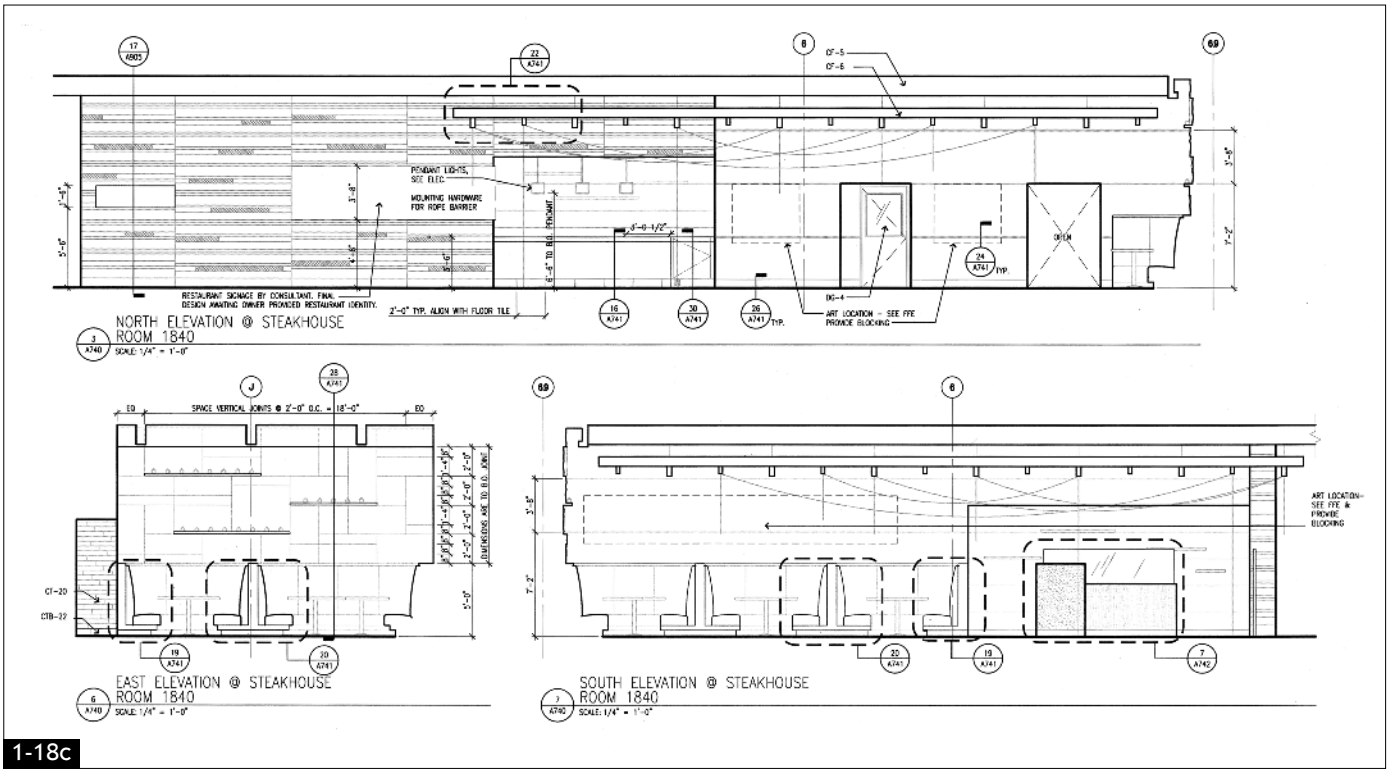

FIGURE 1-18c
Elevations for the project featured in the previous figure.
Figures 1-18a through 1-18c by Cuningham Group Architecture, P.A.

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