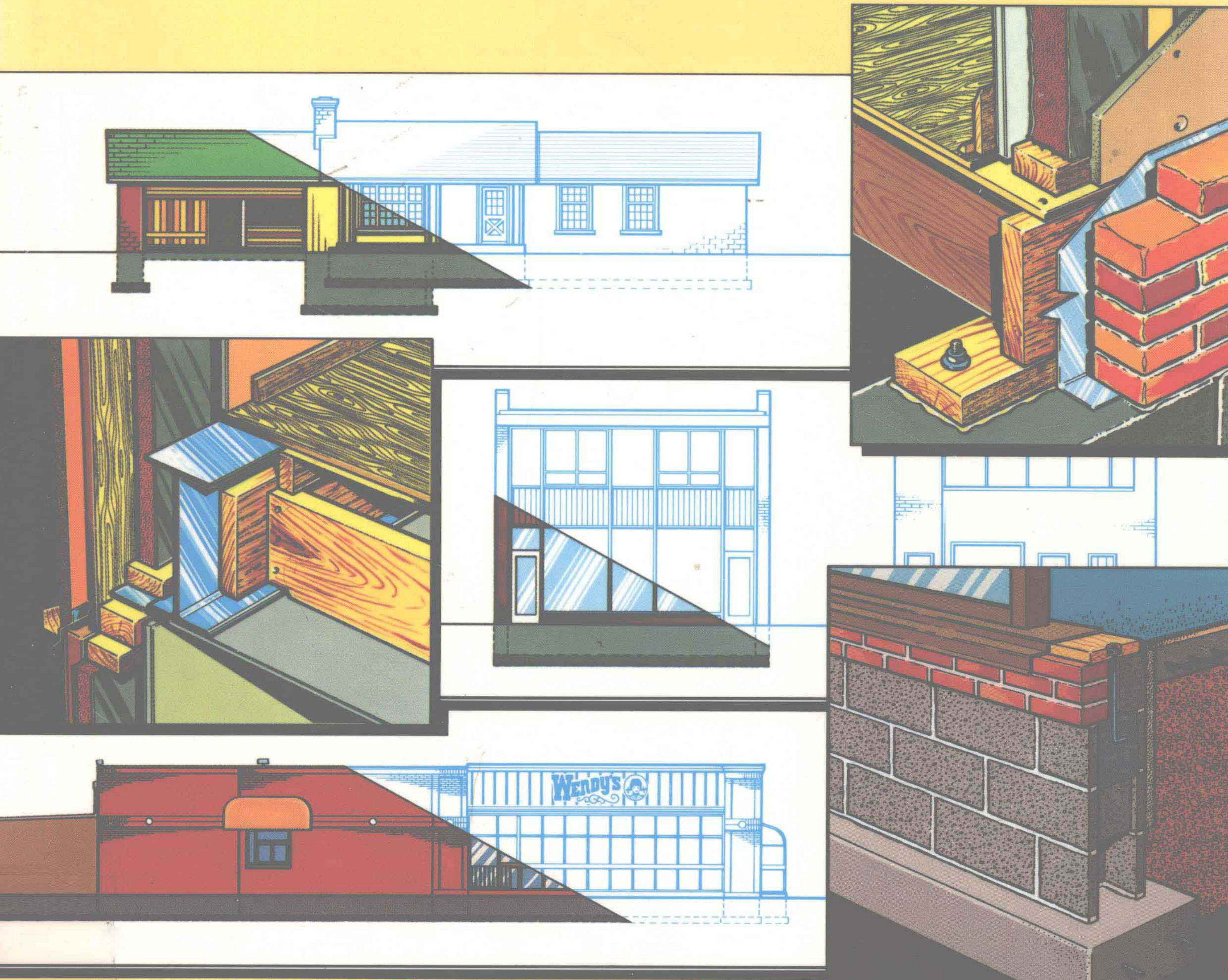
BUILDING TRADES
PRINTREADING - Part 2

RESIDENTIAL AND LIGHT COMMERCIAL CONSTRUCTION

Second Edition



an atp publication

Thomas E. Proctor

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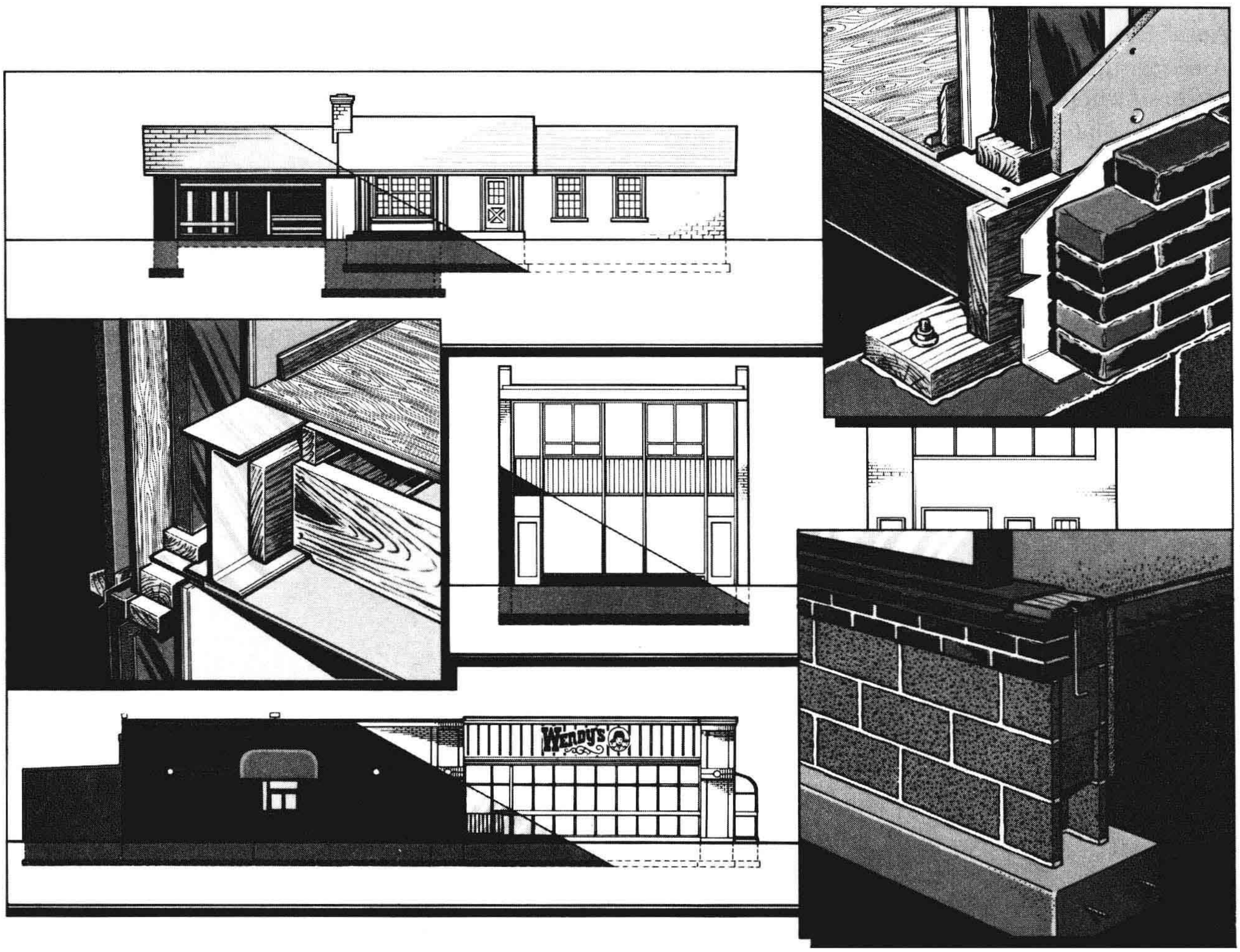

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INTRODUCTION

Building Trades Printreading - Part 2, 2nd Edition provides printreading experience in residential and light commercial construction. The text/workbook is designed to reinforce concepts regarding elements commonly found on prints. Chapters 1 and 2 cover information such as symbols, abbreviations, and conventions. Sketching principles and practices in orthographic and pictorial form are also included. Computer-aided drafting (CAD) is introduced in Chapter 1. The plans for Wendy's Restaurant (Chapter 9) are CAD-generated.

Five sets of plans are included in *Building Trades Printreading - Part 2*, 2nd Edition. These plans show different types of construction and regional applications. These plans are North Carolina Residence, Commercial Building, Fisher Residence, Branch Bank, and Wendy's Restaurant. Four *Trade Plans* are included for study as assigned by your instructor. These plans provide an opportunity to develop additional printreading skills in your trade area. These plans include:

Trade Plan 1: Residence—Framed Wall
Trade Plan 2: Residence—Masonry Wall
Trade Plan 3: Bathhouse for Swimming Pool
Trade Plan 4: Office Renovation

Review Questions and Trade Competency Tests follow each chapter. For the five chapters related to specific plans, Review Questions are based on the chapter text and the Trade Competency Test is based on the plans. Types of questions included are True-False, Multiple Choice, Completion, Identification, Matching, Definition, Math, and Printreading. Always record your answer in the space provided. Answers for all questions are in the *Instructor's Guide for Building Trades Printreading - Part 2*, 2nd Edition.

True-False

Circle T if the statement is true. Circle F is the statement is false.

T (F) **8.** Aluminum should not be used for framing dwellings and small commercial buildings.

Multiple Choice

Select the response that correctly completes the statement. Write the appropriate letter in the space provided.

C **6.** A ____________ is an electromechanical device used to input information into a CAD system.
A. plotter
B. light pen
C. stylus
D. CPU

Completion

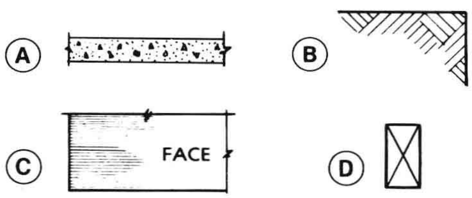
Determine the response that correctly completes the statement. Write the appropriate response in the space provided.

plot **1.** A(n) ____________ plan contains lot and building dimensions.

Identification

Select the response that correctly matches the given word(s). Write the appropriate letter in the space provided.

D **1.** Rough member (section)
A **2.** Concrete (section)
B **3.** Earth (section)
C **4.** Brick (elevation)



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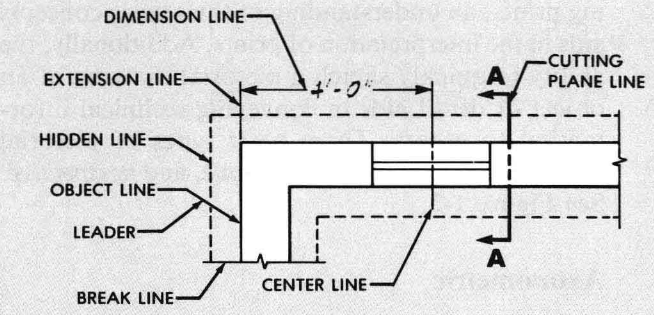

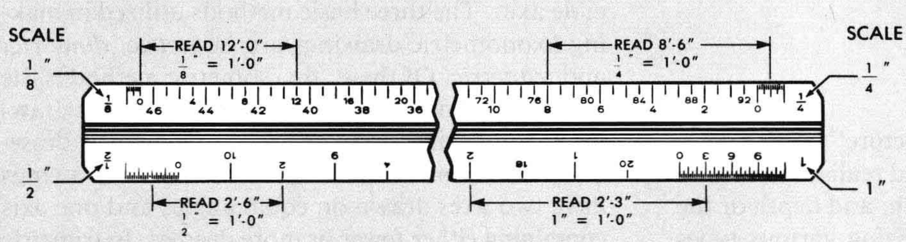

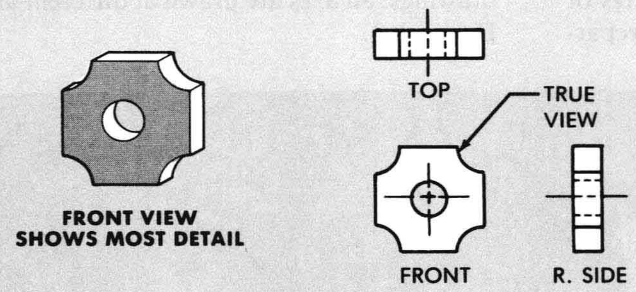

Blueprint Processes
Pictorial Sketches
Alphabet of Lines
Orthographic Projection
Size Description
Shape Description
Written Description
Conventions
Modular Measure
Computer-Aided Drafting

BLUEPRINT PROCESSES

Before the blueprint process was invented, architects drew the working drawings for a building in ink on heavy, durable paper. Each original drawing was the only one available during construction of the building unless additional copies were made by tracing them on transparent (clear) paper or by making an exact duplicate on the same kind of paper.

When the blueprint process was perfected, the original working drawings were made on transparent paper. Each sheet was then placed over a sheet of paper that was treated with light-sensitive chemicals. The two sheets were firmly held in position and exposed to sunlight or some other light source. Wherever a line, dimension, or notation appeared on the tracing, an area of the same image was shielded from the light. When the sensitized paper was washed with water, these areas remained white. The whole background turned a deep blue because the light had changed the chemicals in the paper. The great advantage of the blueprint process was that numerous blueprints could be made from the same tracings. The blueprints were distributed to estimators, builders, and owners. The tracings were stored carefully in the architect's office to be used to make additional blueprints as needed.

Many refinements have been made in the blueprint process. With the new types of light-sensitive paper, new developing methods, and new high speed printing, better prints are available for use by estimators, owners, builders (both contractors and subcontractors), architects, and others. One of the new processes uses an aniline dye in the paper which, when exposed to light, provides prints with a blue line on a white background. See Figure 1-1. The diazo process provides a black line on a white background.

All reproductions of original tracings, regardless of color, line, or background, are commonly referred to as blueprints although they are not technically blueprints. These are thought of as direct copies of the original working drawings. Technically, a distinction is made between blueprints, blue line prints, and black line prints.

PICTORIAL SKETCHES

Pictorial sketches look like a "picture" because they convey a sense of perspective and realism of the object being viewed. Height, length, and depth of the object are easily shown by utilizing various types of pictorial drawings. While pictorial drawings or sketches are only occasionally used when preparing prints, an understanding of their basic concepts aids in the interpretation of prints. Additionally, the ability to quickly sketch a pictorial drawing of an object or detail aids in conveying technical information to others. Three basic types of pictorial drawings are *axonometric, oblique,* and *perspective.* See Figure 1-2.

Axonometric

Axonometric drawings are drawn using three principle axes. The three basic methods utilized in making axonometric drawings are *isometric, dimetric,* and *trimetric.* Of these, the isometric method is the most commonly used. Dimetric and trimetric drawing methods are rarely utilized. In isometric drawings, the axes are 120° apart. Dimetric drawings have two axes drawn on equal angles and one axis containing either fewer or more degrees. In trimetric drawings, all axes are drawn at different angles. See Figure 1-3.

Figure 1-1. Prints with a blue line on a white background are commonly used in the building trades.

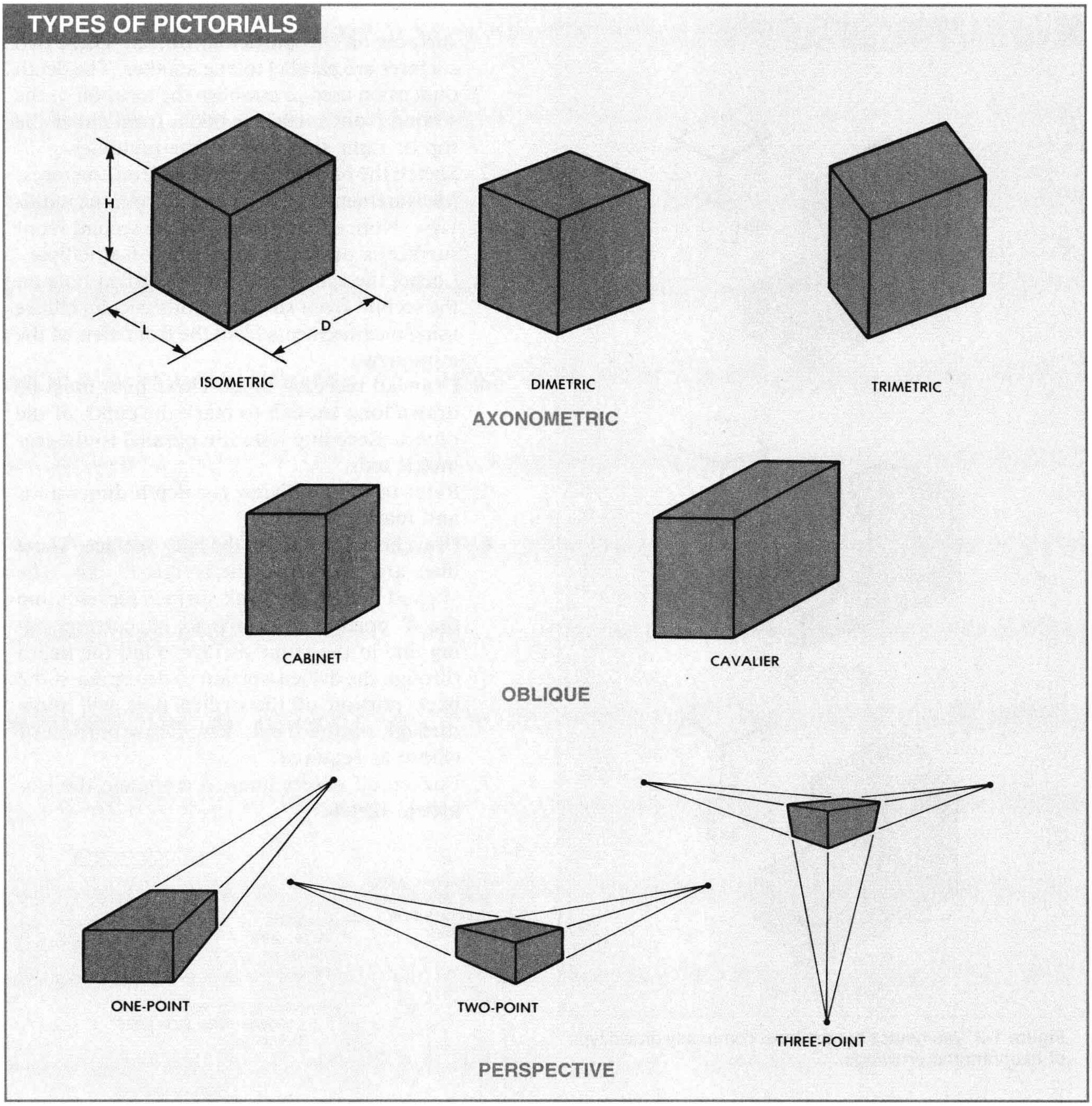

Figure 1-2. Pictorial drawings show height, length, and depth. They convey a "picture" of an object or detail.

Isometric. Isometric drawings are created using drafting instruments such as a T-square and 30°-60° triangle. An isometric sketch can be developed quickly by following the same basic principles used when making isometric drawings with instruments. Isometric drawings contain three equal axes that are drawn 120° apart. Because of this 120° angle, no surface appears as a *normal view* (line of sight is perpendicular to the surface); however, the object has a natural appearance since it is shown as a solid. Because of the skewed sides, circles (drilled holes, counterbores, etc.) appear as ellipses on isometric surfaces. Additionally, arcs appear as portions of ellipses. All surfaces not in one of the three princi-

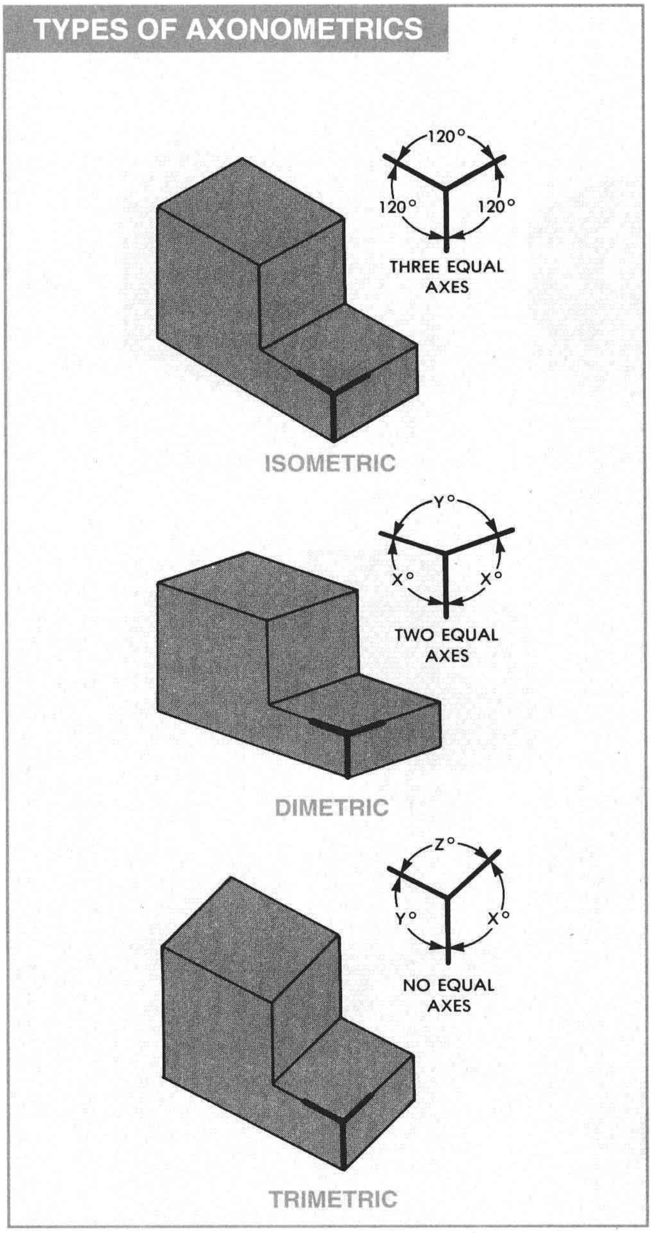

Figure 1-3. Isometrics are the most commonly drawn type of axonometric drawings.

ple isometric surfaces must be drawn by locating end points of the skewed surface. The end points are connected to complete the skewed surface. See Figure 1-4.

Sketching Isometrics. To make isometric sketches of objects, follow the procedure shown in Figure 1-5.

1. Locate the isometric axes and "block in" the front view using length and height measurements from the multiview. There are two front surfaces on this particular object. These two surfaces are parallel to one another. The depth dimension used to establish the location of the second front surface is taken from either the top or right side view of the multiview.
2. Sketch the outline shape of the front surfaces. Measurements are determined from the multiview. Notice that the arc on the second front surface is drawn as a portion of an ellipse.
3. Locate the centerpoint of the drilled hole on the second front surface. Construct an ellipse using measurements from the front view of the multiview.
4. Draw all receding lines. These lines must be drawn long enough to mark the depth of the object. Receding lines are parallel to the isometric axis.
5. Refer to the multiview for depth dimensions and mark depth.
6. Draw lines to establish the back surface. These lines are parallel to the isometric axis. The skewed line on the back surface representing the V portion is drawn to its corresponding line in the front surface. Find the depth through the drilled portion to determine if the back portion of the drilled hole will show through on the front view. Draw portion of ellipse as required.
7. Darken all object lines to complete the isometric sketch.

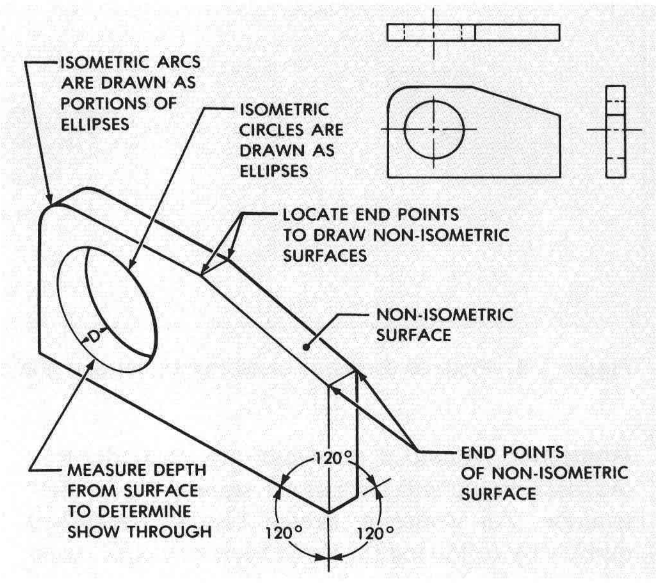

Figure 1-4. Circles on isometric drawings appear as ellipses. Non-isometric surfaces are drawn by locating their end points.

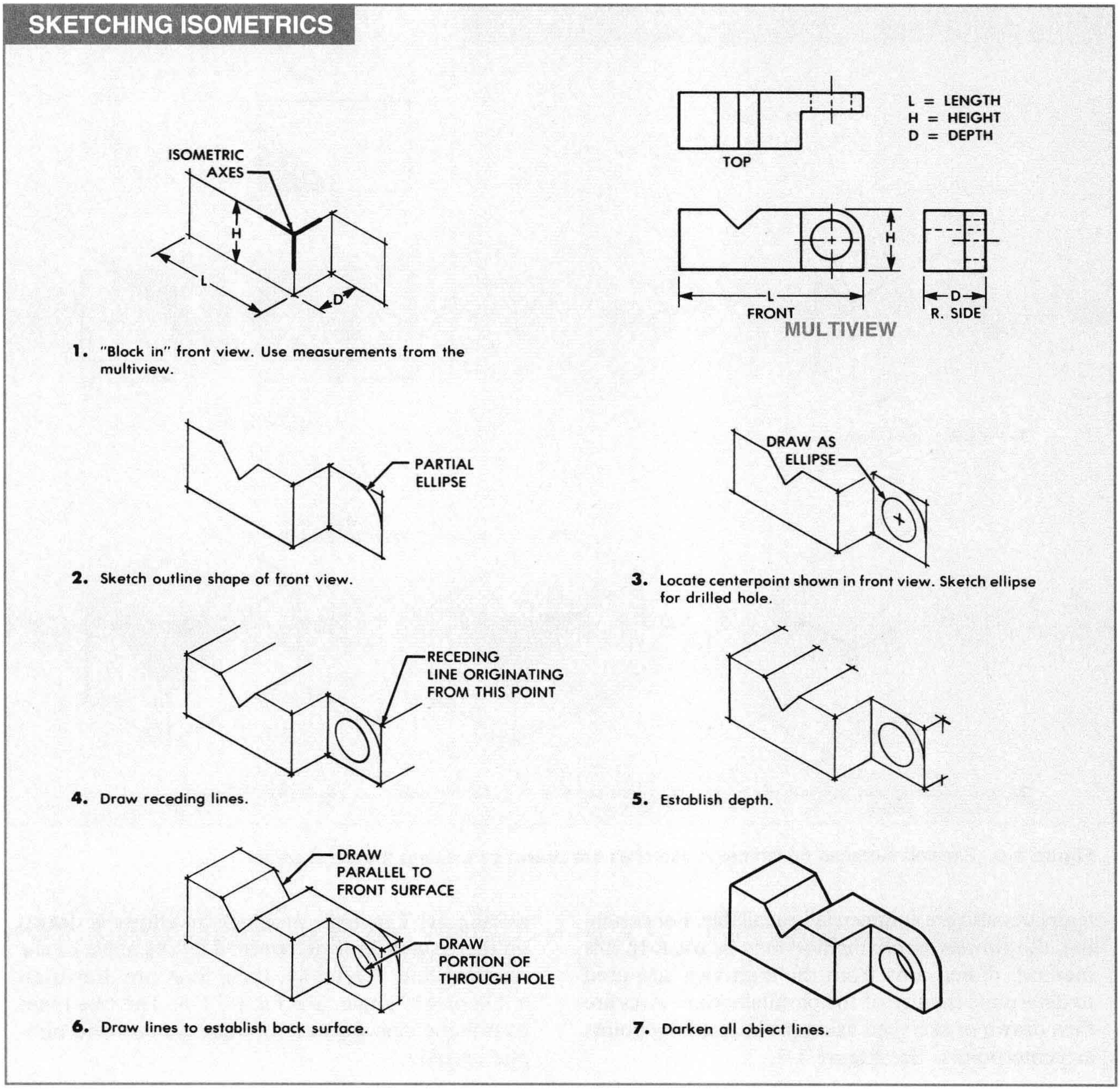

Figure 1-5. Isometric sketches can be quickly sketched to convey a "picture" of an object.

Non-isometric Surfaces. Non-isometric (skewed) surfaces on isometric sketches do not lie in one of the three principle isometric planes. To draw a skewed surface, all end points must first be located on surfaces in isometric planes. These points are connected to complete the skewed surface. See Figure 1-6. Note in the figure shown that surface A, B, C is the skewed surface. It does not lie in an isometric surface.

Circles on Isometrics. Circles on isometric surfaces are drawn as ellipses. An ellipse is a plane curve with two focal points (*foci*). The sum of the distances from these two focal points to any point on the ellipse determines the shape of the ellipse. As the distance between the focal points decreases, the ellipse becomes more circular in shape.

Several methods of constructing ellipses with drafting instruments are available to drafters. Ellipse

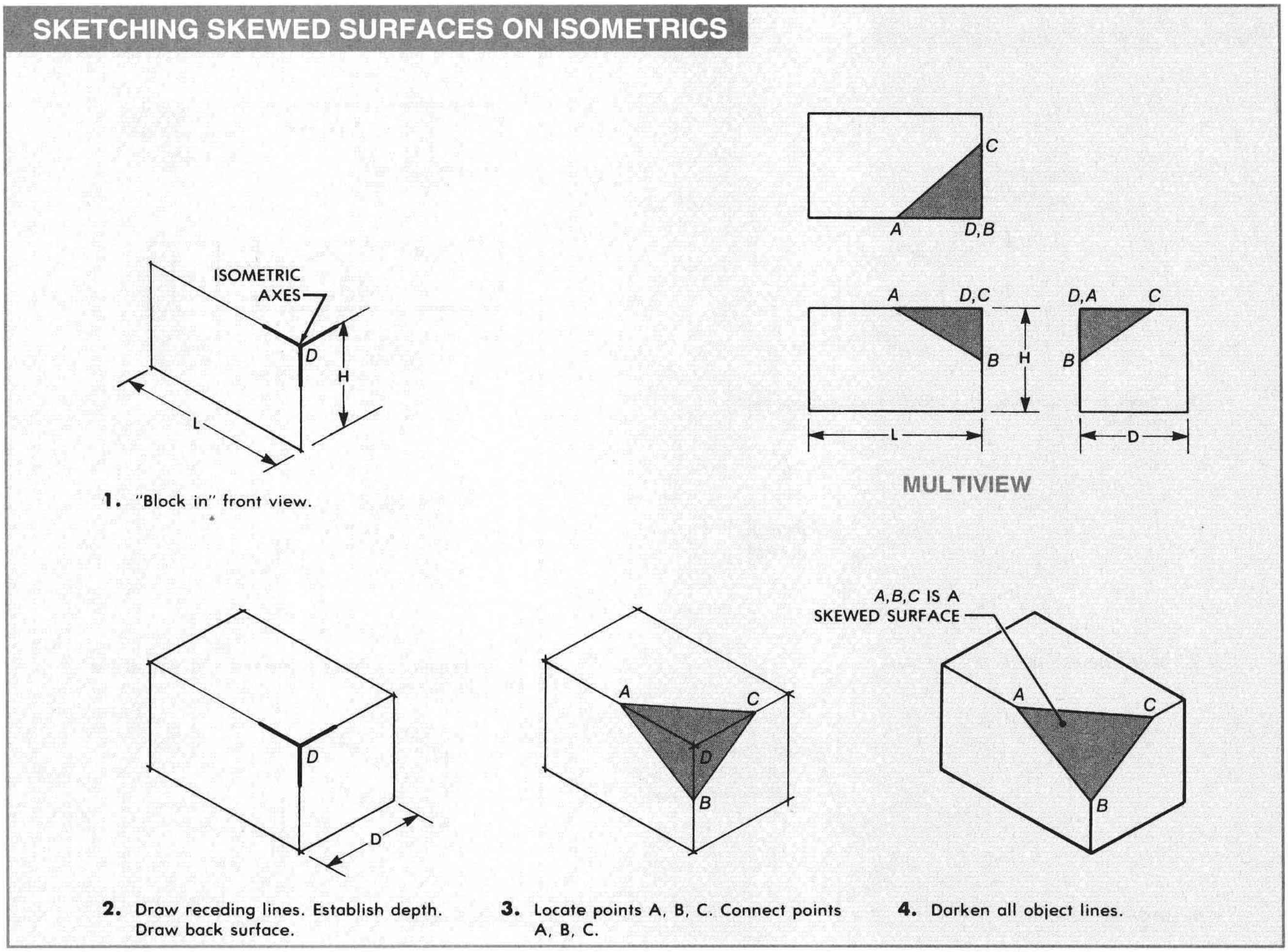

Figure 1-6. Skewed surfaces on isometric sketches are drawn by locating their end points.

templates also are commercially available. For sketching, the *parallelogram* method may be used. In this method, dimensions from the multiview are used to determine the size of the parallelogram. Arcs are then drawn or sketched using the intersecting points as centerpoints. See Figure 1-7.

Oblique

Oblique drawings show one face (surface) of an object as a *true view* (line of sight is 90° to the face). All other faces of the object are distorted by the angle of the receding, oblique lines. All features shown on the face containing a true view are drawn as they appear. Additionally, right angles are shown at 90° on surfaces having a true view. For example, a drilled hole shown on the true view face of an oblique drawing is shown as a circle. Drilled holes on any other surface of the oblique drawing appear as ellipses. The angle at which an ellipse is drawn on these surfaces is determined by the angle of the receding line. Normally, these lines are drawn on a 30° or 45° angle. See Figure 1-8. The two types of oblique drawings are oblique *cabinet* and oblique *cavalier.*

Cabinet. Oblique cabinet drawings show a true view of one surface with all receding lines drawn to one-half the length of corresponding lines in the true view. This is the most commonly used type of oblique drawing. Cabinet drawings, as the name implies, are often used to show kitchen and bathroom cabinets. This method of drawing allows a true view of the major surfaces (usually the front of the cabinets) and conveys a sense of perspective with receding lines showing other surfaces. See Figure 1-9. Circles, arcs, and all lines 90° to line-of-sight that

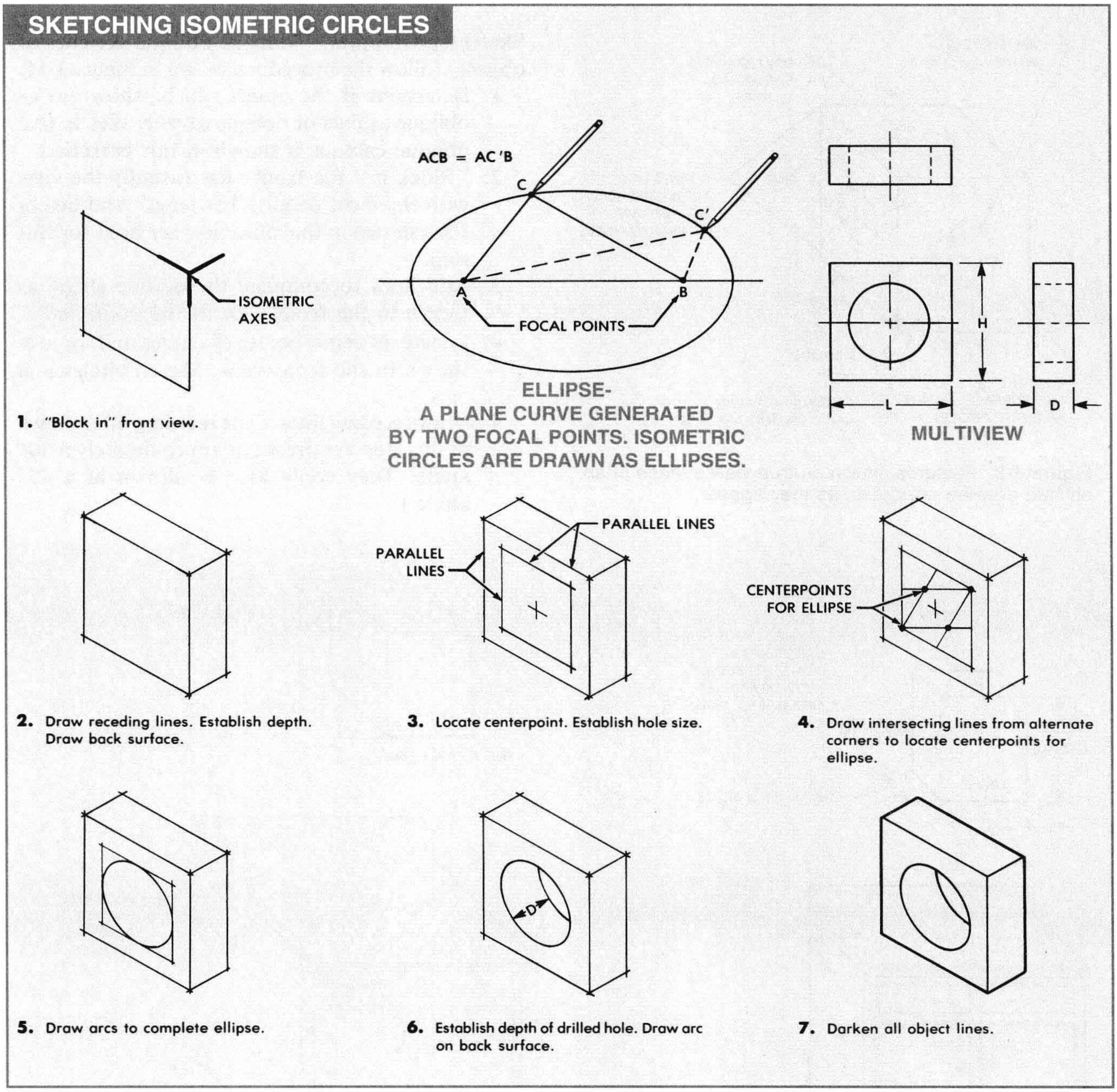

Figure 1-7. Circles on isometrics appear as ellipses.

are shown in the true (usually front) view appear as seen and are not distorted. All surfaces drawn with receding lines do not provide a true view. Circles on these surfaces appear as ellipses.

Cavalier. Oblique cavalier drawings show a true view of one surface with all receding lines drawn to the same scale used to draw lines in the true view. The use of the same scale to draw all oblique lines of an oblique cavalier drawing produces a distorted pictorial drawing. Consequently, this type of drawing is seldom utilized. Circles, arcs, and oblique lines are drawn in the same manner as for oblique cabinet drawings with the view showing the most features commonly selected to be drawn as the front view. See Figure 1-10.

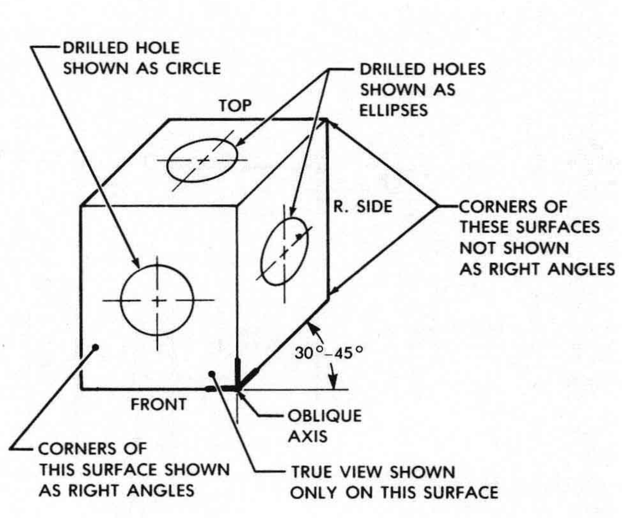

Figure 1-8. Features shown on true view surface of an oblique drawing are drawn as they appear.

Sketching Obliques. To make oblique sketches of objects, follow the procedure shown in Figure 1-11.

1. Determine if the object will be shown as as oblique cabinet or oblique cavalier sketch. (An oblique cabinet is shown in this exercise.)
2. "Block in" the front view (usually the view with the most detail). The length and height sizes shown in the multiview are used for this step.
3. Add lines to complete the outline shape as shown in the front view of the multiview.
4. Locate all centerpoints of circles and/or arcs shown in the front view. Sketch circles and arcs.
5. Draw receding lines. (The receding lines shown in this step are drawn at approximately a 30° angle. They could also be drawn at a 45° angle.)

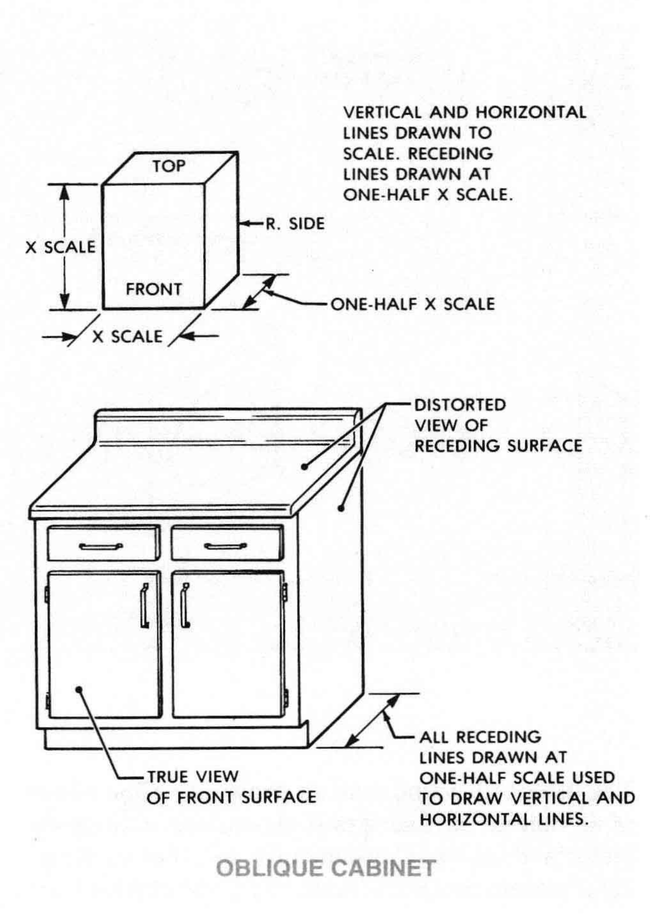

Figure 1-9. All receding lines of oblique cabinet drawings are drawn at one-half the scale used to draw vertical and horizontal lines.

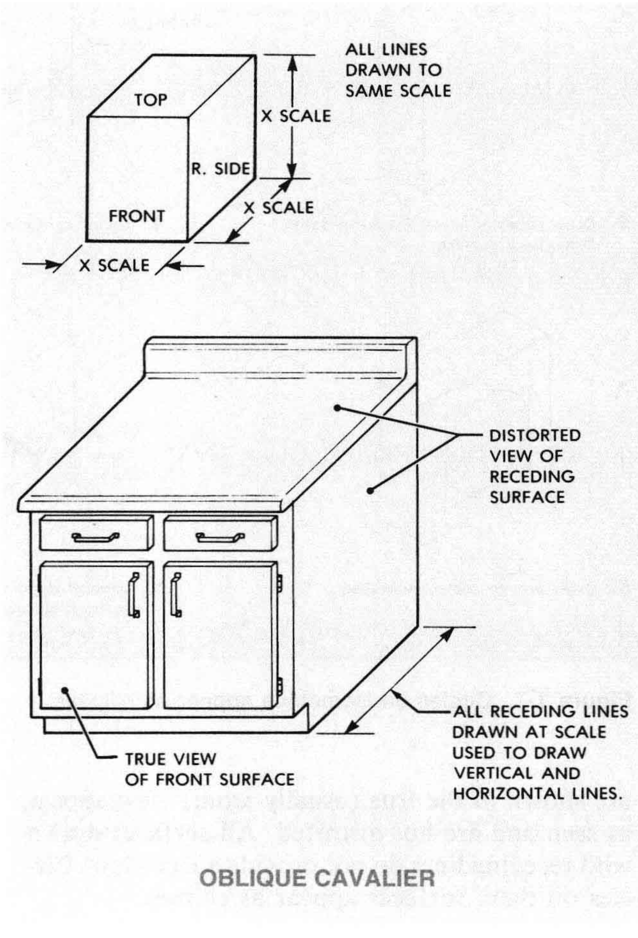

Figure 1-10. All lines of oblique cavalier drawings are drawn at the same scale.

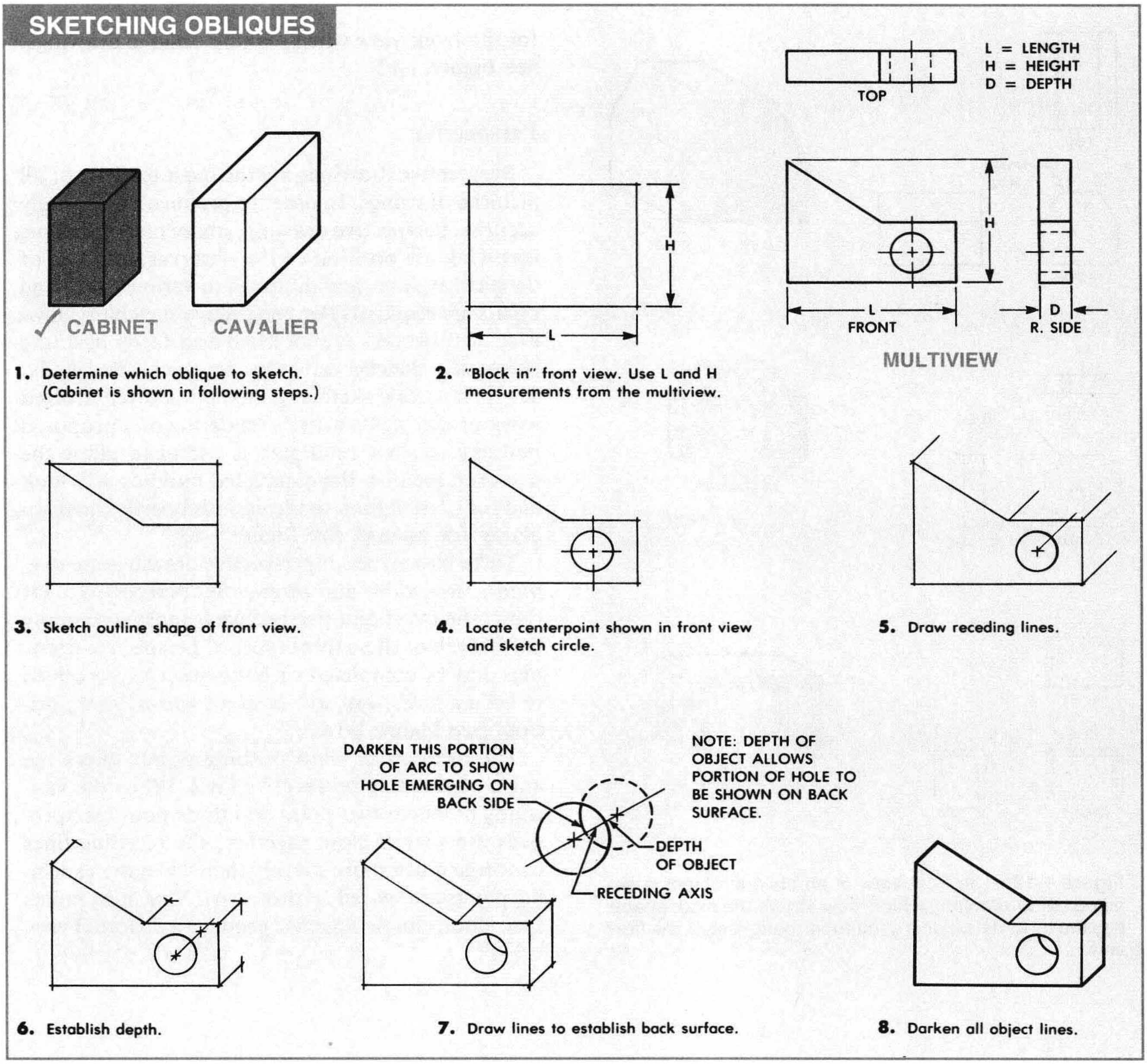

Figure 1-11. Oblique drawings can be quickly sketched to convey a "picture" of an object.

6. Establish depth. This dimension is taken from the right side or the top view of the multiview. Note that only one-half the dimension shown is drawn for depth of the oblique cabinet.
7. Draw lines to represent the object's back surface. When holes are drilled completely through the object being drawn, determine if the back side of the hole will show by measuring the depth along a receding line drawn from the centerpoint of the hole on the front surface.
8. Darken all object lines. Construction lines may be erased, if desired.

When sketching oblique drawings, notice that the true view represents a plane surface. If an object has two or more plane surfaces to be shown in the true view, the drawing is blocked out and receding lines are used to connect the plane surfaces. The view showing the most shape of the object, the view containing the larger number of circles and arcs, or the view commonly thought of as the front is selected

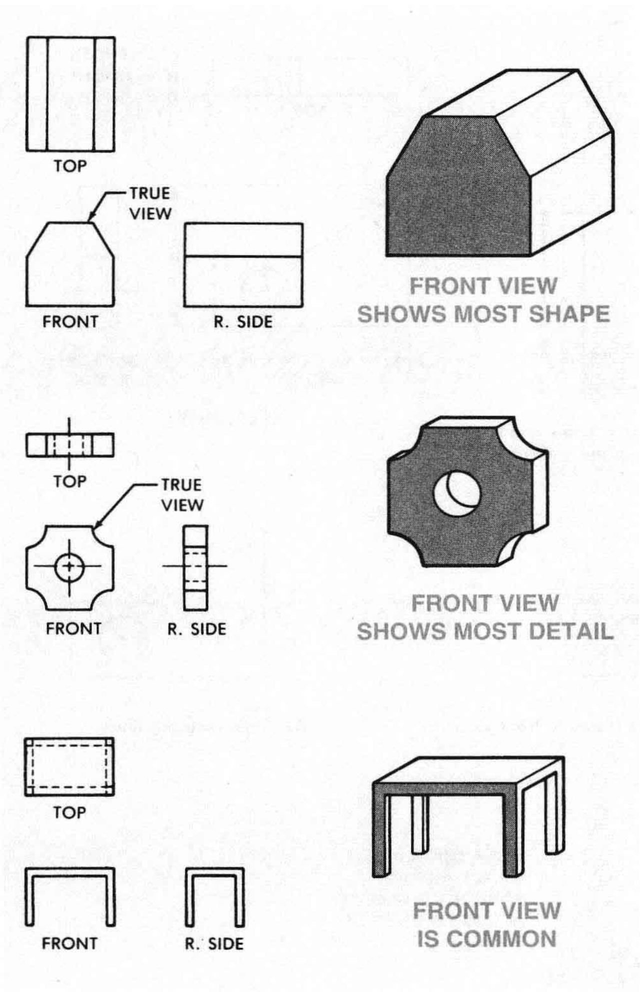

Figure 1-12. The front view of an oblique object is selected by determining which view shows the most shape, has the most detail, or is commonly thought of as the front view.

for the front view when making oblique drawings. See Figure 1-12.

Perspective

Perspective drawings are the most realistic of all pictorial drawings. In order to produce a technically accurate perspective drawing, many measurements involving the position of the observer, location of the picture plane, and distances to various vanishing points are required. For perspective sketching, however, this process is simplified and fairly accurate perspective sketches can be drawn quickly and easily. The perspective sketching method is often utilized when preparing an artist's rendering of a proposed building. Such a rendering is useful to allow the owner to see how the completed building will look and for presentation to the various boards when applying for zoning. See Figure 1-13.

Three basic types of perspective drawings are *one-point, two-point,* and *three-point* perspectives. Of these, the two-point perspective is most commonly used. Each of these three types of perspective drawings may be completed with the observer perceived to be in a *bird's-eye, eye-level,* or *worm's-eye* position. See Figure 1-14.

The location of the vanishing points alters the angle of receding perspective lines. When the vanishing points of two-point and three-point perspectives are spaced close together, the receding lines converge much more sharply than when the vanishing points are spaced farther apart. Vanishing points spaced too closely together produce a distorted view

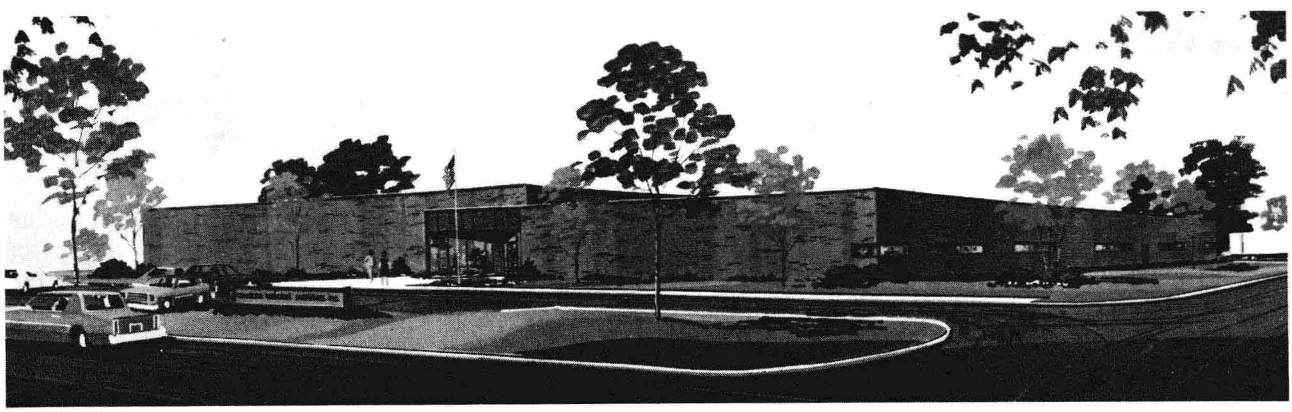

Figure 1-13. Artists' renderings utilize perspective sketching.

of the drawn object. Refer to Figure 1-14 and note the position of the vanishing points for the two-point and three-point perspective sketches. The third sketch of each shows the vanishing points spaced apart, producing a more realistic sketch.

When labeling vanishing points for referencing during sketching, abbreviations are used. For example, the vanishing point in a one-point perspective sketch is abbreviated *VP*. The vanishing points for a two-point perspective are labeled *VPL* for vanishing point left and *VPR* for vanishing point right. For three-point perspectives, *VPB* or *VPT* indicates either a bottom or a top vanishing point.

Sketching Perspectives. To make perspective sketches of objects, follow the procedure shown in Figure 1-15.

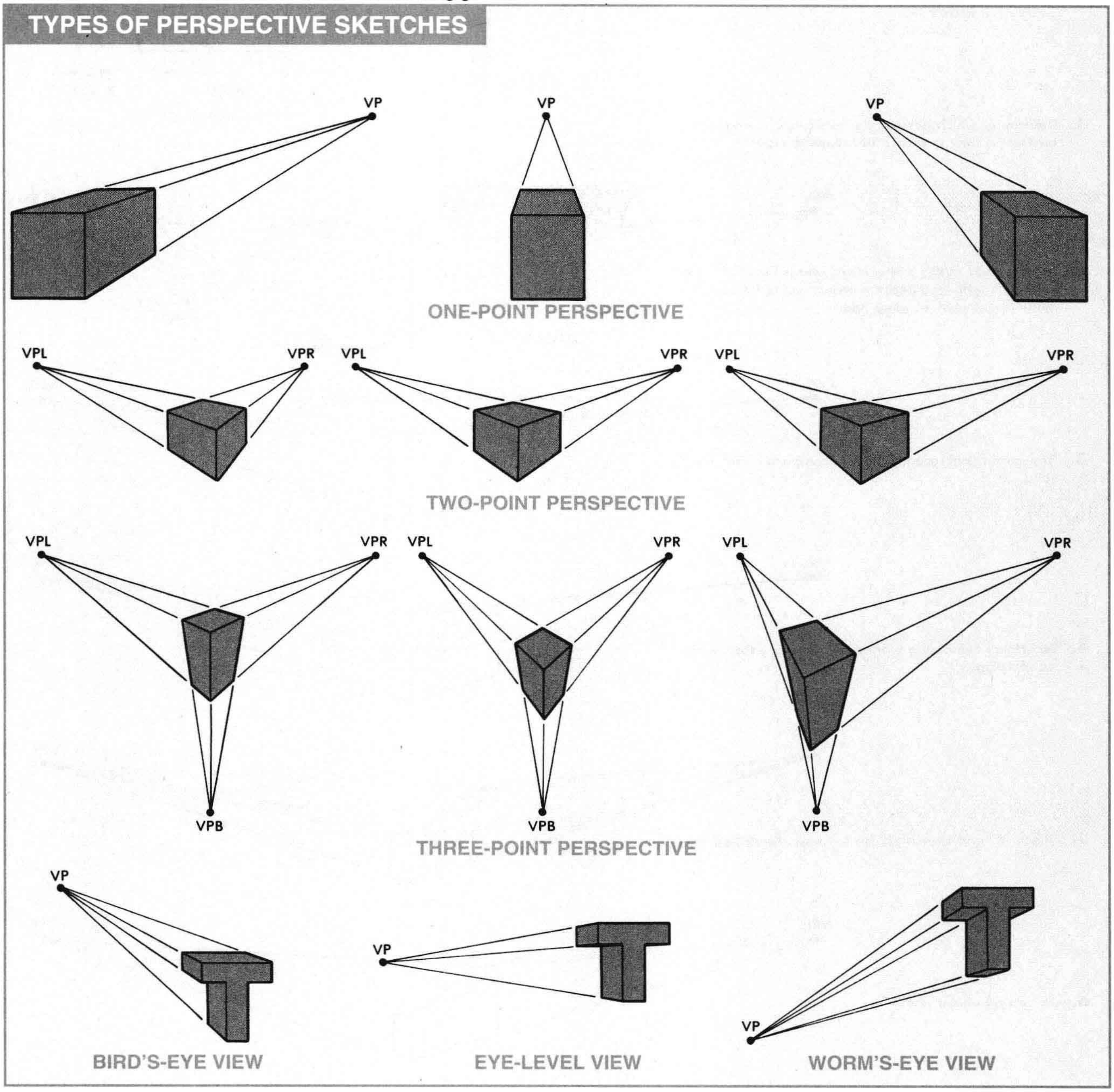

Figure 1-14. Perspective sketches may be one-, two-, or three-point. They are drawn as bird's-eye, eye-level, or worm's-eye views.

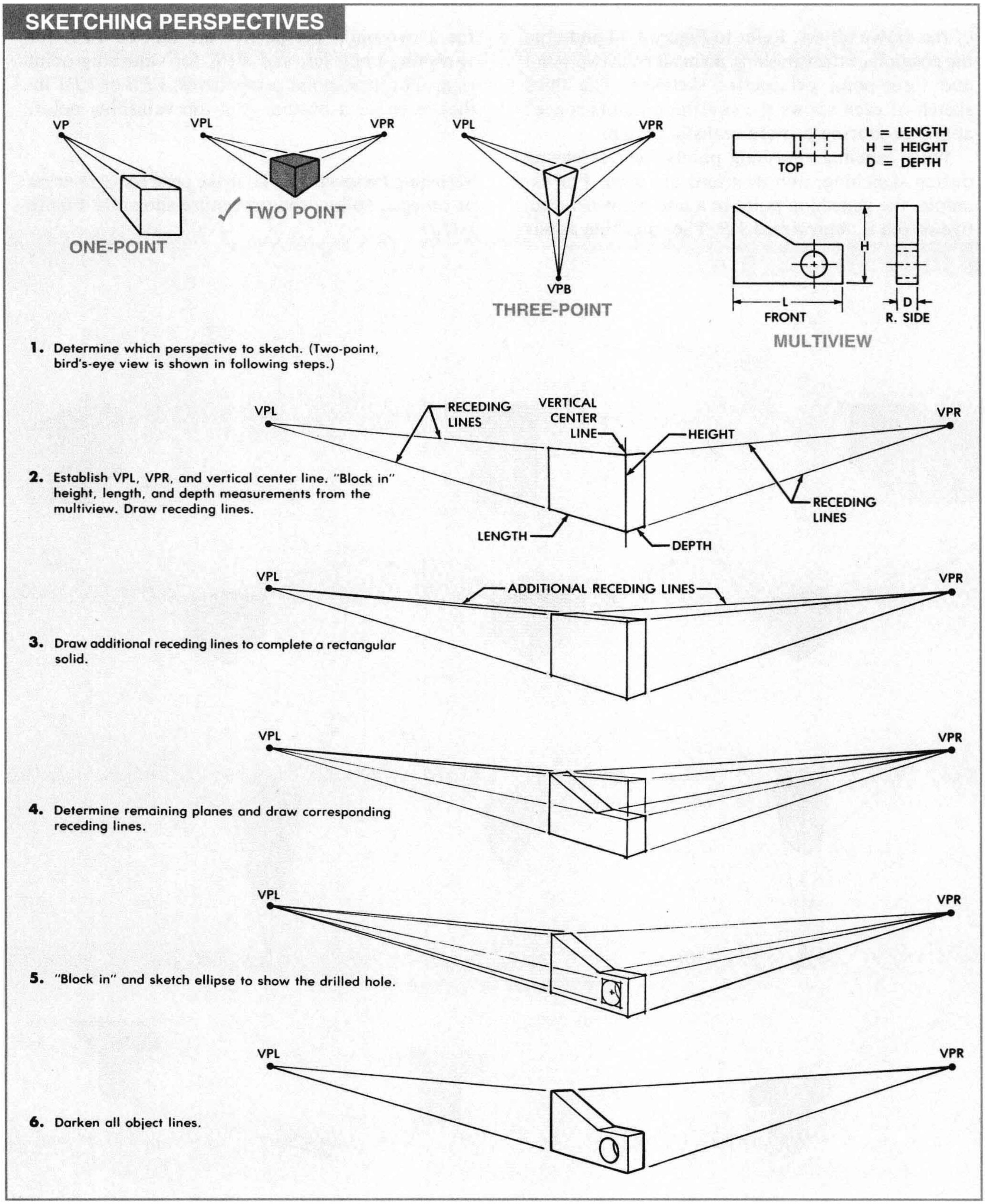

Figure 1-15. Perspective sketches utilize receding lines for a natural appearance.