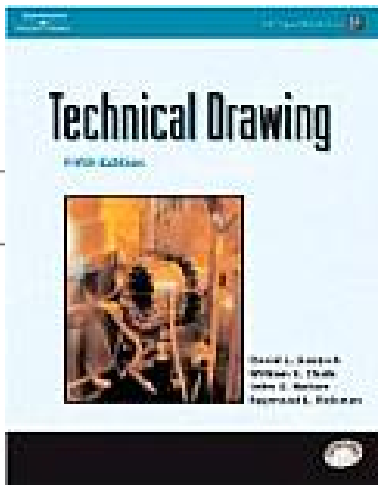
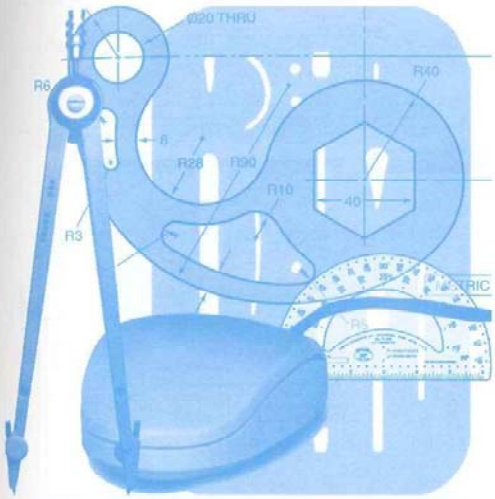


Chapter 3



MANUAL LETTERING, SKETCHING, AND LINE TECHNIQUES

KEY TERMS

Axonometric sketching
Boardroom sketching
Center line
Conversational sketching
Cutting plane line
Dimension line
Extension line
Hidden line
Isometric (sketching)
Line work
Oblique sketching
Orthographic sketching
Perspective sketching
Phantom line
Text
Visible line

CHAPTER OUTLINE

Talking sketching • Freehand lettering • Freehand lettering techniques • Line work • Sketching • Types of sketches • Sketching materials • Sketching techniques • Summary • Review questions • Chapter 3 problems

CHAPTER OBJECTIVES

Upon completion of this chapter students should be able to do the following:

- Explain the concept of talking sketching, including the two kinds.
- List the various styles of freehand lettering and the characteristics of good lettering.
- Explain the techniques one must know in order to do freehand lettering.
- Illustrate the various types of lines used on technical drawings.
- Illustrate the four types of sketches.
- Explain what materials are needed in order to make sketches.
- Demonstrate the most commonly used sketching techniques.

Note to Instructors and Students

Although modern CAD technologies have altered radically the way that design documentation is prepared, there is still a need for engineers, designers, and CAD technicians to develop their skills in the areas of sketching, hand lettering, and line work. Sketches remain an important form of communication between engineers, designers, and the CAD technicians who will convert their ideas into finished drawings and other types of documentation. Consequently, the authors continue to offer this chapter and recommend that instructors use it to help students develop the sketching, lettering, and line work skills they will need in the workplace.

Talking Sketching

Two types of sketching, which are often neglected in technical drawing texts but nevertheless complement the skills of a successful drafter, designer, or engineer, are conversational sketching and boardroom sketching.

Conversational Sketching

Conversational sketching usually occurs between two or more individuals huddled around a drafting board or a cafeteria table. The one doing the talking combines several types of sketches in one drawing as the idea is talked through. The first part of the sketch is most likely an orthographic view, the easiest projection to draw rapidly. Then, as the talking progresses, a pictorial is used to give the observers a feeling of depth. For example, a designer communicating an idea for an AM/FM receiver would begin with the orthographic view, *Figure 3-1*, and finish with a pictorial, *Figure 3-2*. A drafter, designer, or engineer sketches rapidly while talking and doesn't have time to develop a single specific kind of sketching, such as orthographic views, an isometric, an oblique, or a two-point perspective.

Boardroom Sketching

Communication with more individuals than a drafting board can accommodate requires a more visible surface for the larger group. The drawing surface for *boardroom sketching* sometimes is a chalkboard, but more often is a pastel-colored porcelainized enamel, a glass panel, or a dry-erase surface. All of these surfaces require a special marker and can be erased with a cloth.

Quality talking sketches, like quality sketching discussed earlier in this chapter, require practice to develop visible lines and especially to develop lettering large enough to be read by those sitting at the back of the room.

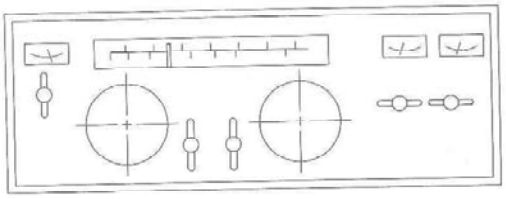


FIGURE 3-1 *Talking sketch (orthographic view)*

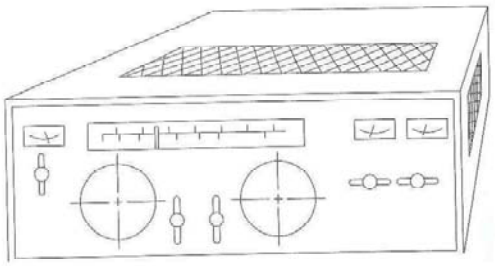


FIGURE 3-2 *Talking sketch completed with pictorial*

Note that sketching and lettering on overhead projectors is another medium for talking sketching. Practice to make sure that all those present can read all the lettering and see the lines. Additional comments on the use of overhead projectors are in Chapter 24.

Freehand Lettering

Text is an important part of a technical drawing. Not all information required on technical drawings can be communicated graphically, the most obvious being dimensions. *Text* on technical drawings consists of dimensions, notes, legends, and other data that are best conveyed using alphanumeric characters, *Figure 3-3*.

Several different ways are used to create text on technical drawings. The traditional method is by freehand lettering. Other methods include such mechanical lettering techniques as scriber templates, typewritten notation, and typed lettering generated by computer-aided drafting systems. This chapter focuses on freehand lettering. Other methods are described elsewhere in this text.

Lettering Styles

There are numerous different lettering styles or fonts, *Figure 3-4*. The standard style for freehand lettering on technical drawings, as established in American National Standards document Y14.2-1973, is single-stroke Gothic lettering. Vertical, single-stroke Gothic letters are

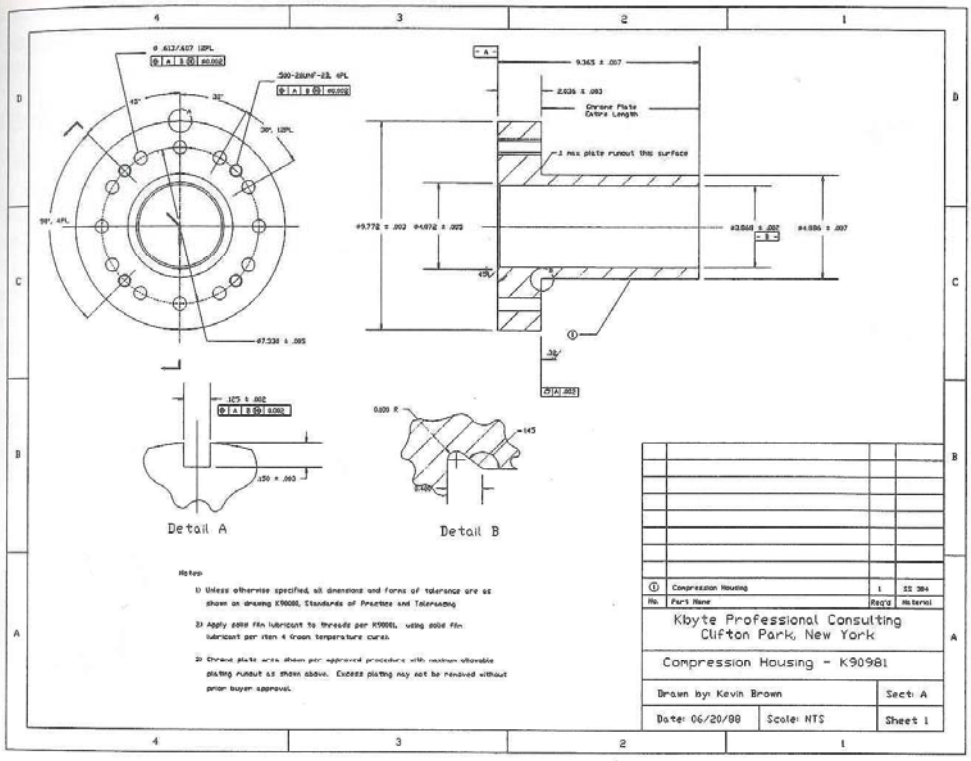


FIGURE 3-3 *Examples of text on a technical drawing*

THIS IS BLOCK FONT

THIS IS FAST FONT

THIS IS FUTURA FONT

THIS IS LEROY FONT

THIS IS OLD ENGLISH FONT

THIS IS RIVERA FONT

THIS IS TIMES FONT

THIS IS HELVET FONT

BAUSCH & LOMB FONTS

FIGURE 3-4 *Sample lettering fonts* (Courtesy Bausch & Lomb, Inc.®)

SINGLE - STROKE GOTHIC

LETTERING SAMPLE

FIGURE 3-5 *Single-stroke Gothic lettering*

the most universally used of the various styles available to drafters, *Figure 3-5*.

Some modifications of the standard Gothic configuration of letters are often made, without actually changing from the Gothic style of lettering. One way is through the use of uppercase and lowercase letters, *Figure 3-6*, but this is seldom acceptable on technical drawings. Another method is to condense or extend the letters, *Figure 3-7*.

The most common way of modifying Gothic letters is by inclining them slightly to the right, *Figure 3-8*. Inclined lettering is easier to make as it lends itself to a natural direction of wrist action. The correct angle of the inclined

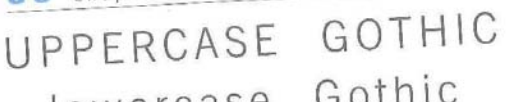


FIGURE 3-6 *Uppercase and lowercase Gothic lettering*

FIGURE 3-7 *Extended and condensed variations of Gothic lettering*

FIGURE 3-8 *Inclined Gothic lettering*

elements is a two-unit incline to the right for each five units of letter height. Errors are not as detectable with inclined letters as they are with vertical elements. Because the inclined elements are longer, they are easier to read. However, inclined lettering is not universally accepted, and caution must be exercised not to conflict with customary drafting styles. A backhanded or left-leaning inclination is never an acceptable modification.

Characteristics of Good Lettering

Good freehand lettering, regardless of whether it is uppercase or lowercase, condensed or extended, or vertical or inclined, must have certain characteristics. These requisites include neatness, uniformity, stability, proper spacing, and speed.

Neat lettering is important so that the information being conveyed can be easily read. Few things detract from the appearance and quality of a technical drawing more than sloppy lettering, *Figure 3-9*.

For uniformity, all letters should be the same in height, proportion, and inclination. A necessary tactic for maintaining uniformity is the use of guidelines, *Figure 3-10*. The customary heights of characters in technical drawing are 1/8″ (3 mm) for regular text, and 3/16″ (4.5 mm) for headings and titles.

The proper stability or balance of letters is an important characteristic in freehand lettering. Each letter should appear balanced and firmly positioned to the human eye. Top-heavy letters are not balanced because they appear about to topple over, *Figure 3-11*.

The proper spacing of letters and words is important, and it takes a lot of practice to accomplish. A good rule of

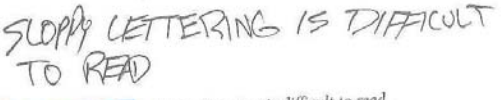


FIGURE 3-9 *Sloppy lettering is difficult to read.*

FIGURE 3-10 *Guidelines improve uniformity.*

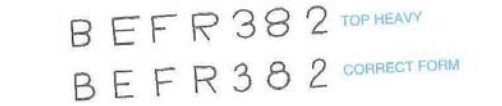


FIGURE 3-11 *Top-heavy letters are not balanced.*

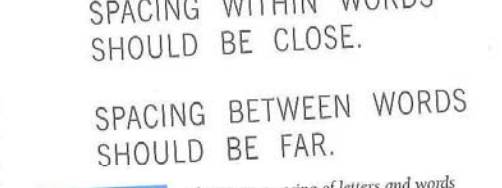


FIGURE 3-12 *The proper spacing of letters and words*

FIGURE 3-13 *Spacing between words is important.*

thumb to follow in terms of spacing is to use close spacing within words, and far spacing between words, *Figure 3-12*. The proper positions of letters relative to one another in words is accomplished by spacing the letters in the word equally in the area, not by trying to equalize the spacing between letters. This becomes automatic if the drafter concentrates on the word being lettered, not on each letter. Another rule of thumb for spacing is to allow the width of one round letter, such as O, C, Q, or G, between words. *Figure 3-13* illustrates how this type of spacing can make the lettering much easier to read.

In the modern drafting room, because time is money, speed in freehand lettering is critical. Typically, freehand lettering is one of the slowest, most time-consuming tasks drafters must perform. It takes many hours of practice to develop freehand lettering that is neat, uniform,

balanced, properly spaced, and fast. Some drafters never reach this goal. Those who do, reach it through constant practice, coupled with continual efforts to improve.

Freehand Lettering Techniques

Freehand lettering techniques are learned by knowing what grades of lead to use, how to make the basic lettering strokes, and how to use guidelines, and by constantly practicing and trying to improve.

Lettering in ink has been greatly simplified in recent years. Old-fashioned tools, such as adjustable-nib ruling pens and speedball pens, have been replaced by the less cumbersome, easier-to-use technical pen, *Figure 3-14.*

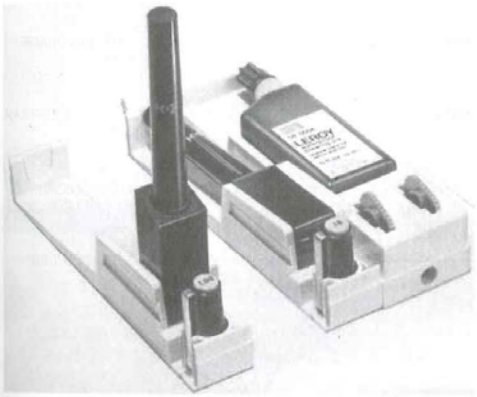


FIGURE 3-14 *Modern technical pens* (Courtesy Keuffel & Esser Co.)

When lettering in ink, drafters still use light guidelines made with pencil lead. The actual lettering is done with the desired pen point size. Commonly used pen points for lettering in ink are sizes 0, 1, and 2, which are standard American sizes. In metrics, these point sizes represent line widths of 0.35 mm, 0.50 mm, and 0.60 mm.

All letters and numbers are created using six basic strokes, *Figure 3-15.* The first stroke is a single stroke made downward and to the right at approximately 45°. The second stroke is made downward and to the left at approximately 45°. The third stroke is vertical and is made from top to bottom. Stroke number four is horizontal and is made from left to right. The fifth stroke is a half-circular stroke to the left, made from top to bottom. The sixth stroke is a half-circular stroke to the right, made from top to bottom. All alphanumeric characters can be created using combinations of these six strokes. *Figure 3-16* shows how these strokes are used for making selected characters.

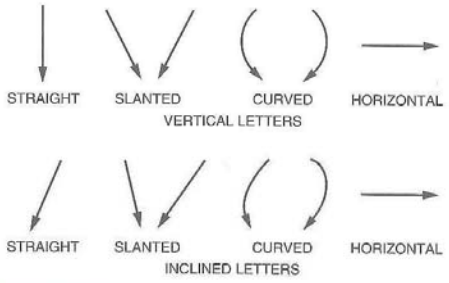


FIGURE 3-15 *Basic strokes used for lettering*

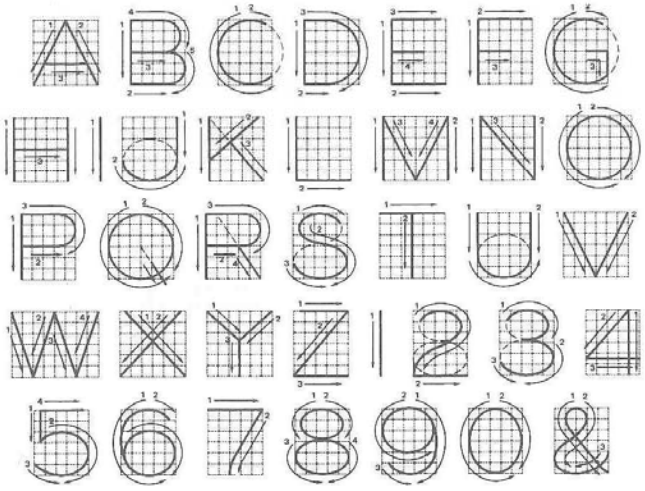


FIGURE 3-16 *Forming uppercase Gothic letters and numerals—vertical style*

Lettering Guidelines

Guidelines are a critical part of freehand lettering. Uniformity, neatness, and stability cannot be achieved without using guidelines.

Line Work

Line work is the generic term given to all of the various techniques used in creating the graphic data on technical drawings. Mechanical line work is made using either mechanical pencils or technical pens. Such devices as parallel bars, drafting machines, triangles, scales, and numerous other tools are used to guide the line-making. Since inking is dealt with in the first chapter, this chapter focuses on pencil line work.

Characteristics of Lines

Twelve basic types of lines are used in manual drafting. Each has its own individual characteristics. The *visible line* is thick and dark. The *hidden line* is a series of short dashes separated by even shorter breaks. The hidden line is thinner than the visible line. *Dimension lines* and *extension lines* are solid, thin lines of approximately the same width as hidden lines. Dimension lines should be broken for dimensions and should have arrowheads for terminations.

The *center line* is broken with one short dash in its center. It is the same width as the hidden, dimension, and extension lines. The *phantom line* is just like the center line except that it has two dashes. The dashes are repeated approximately every two inches. The *cutting plane line* is thick like the visible line and consists of a series of long, equally spaced dashes. All lines used on technical drawings should closely match those in ***Figure 3-17.***

Horizontal and Vertical Lines

Horizontal lines are formed by pressing the straightedge (T-square, parallel bar, drafting machine scale, and so forth) against the worksheet with one hand and moving the pencil with the other. Uniformity of line widths and weights can be achieved by holding the pencil at approximately 60° from the drawing surface, maintaining an even pressure downward, and slowly revolving the pencil axially as it moves across the drawing surface, ***Figure 3-18.*** This keeps the lead tip symmetrical.

Vertical lines are created according to the same principles, except that the drafter's hand moves upward rather than from left to right. The angle of inclination, the amount of pressure, and the rotating motion are the same as they are for horizontal lines.

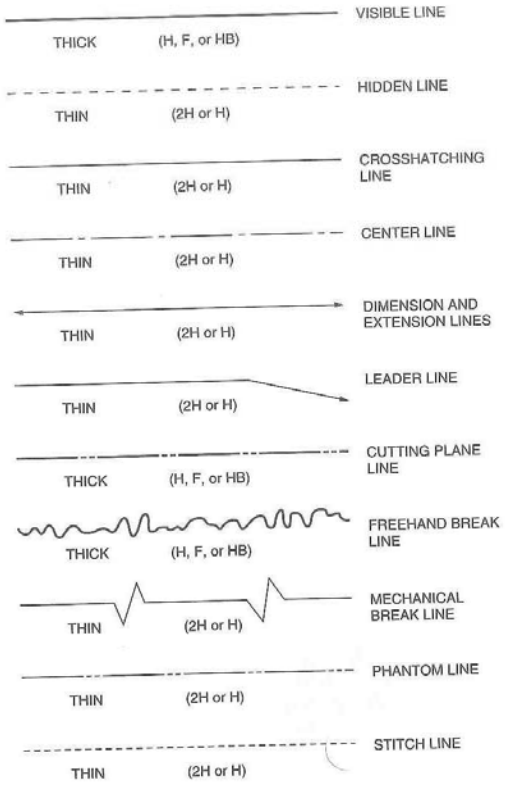


FIGURE 3-17 *Line types used on technical drawings*

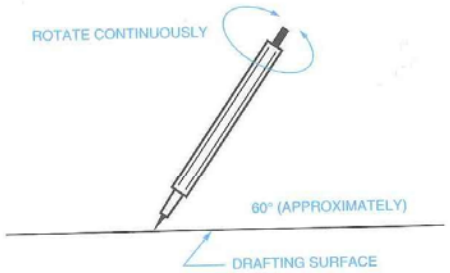


FIGURE 3-18 *Maintaining uniformity of lines*

Angular Lines

Many modern devices are available to assist drafters in making angular lines. These include protractors, adjustable triangles, and adjustable arms on drafting machines. However, most angular lines can be created

simply by using the standard 30°–60° and 45° triangles alone and in various combinations, *Figures 3-19, 3-20, 3-21,* and 3-22. These standard tools create angles of 15°, 30°, 45°, 60°, and 75°.

Parallel Lines

Parallel lines can be created in a number of different ways. Vertical (and horizontal) parallel lines are made by simply moving the straightedge the required distance and making each successive line, *Figure 3-23.*

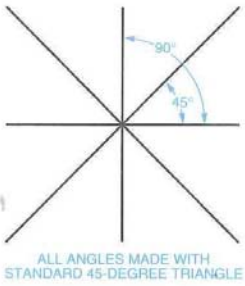


FIGURE 3-19 *Making angular lines with the 45° triangle*

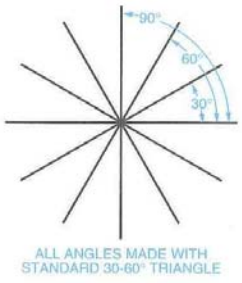


FIGURE 3-20 *Making angular lines with the 30°–60° triangle*

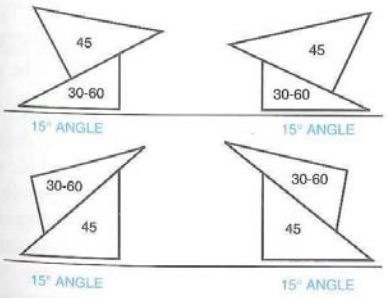


FIGURE 3-21 *Making 15° angles*

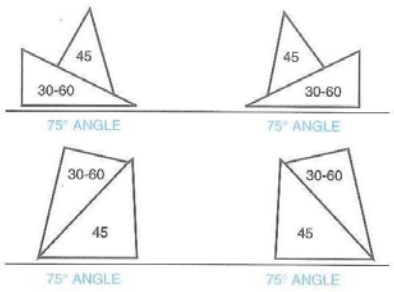


FIGURE 3-22 *Making 75° angles*

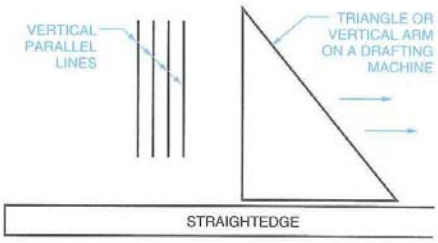


FIGURE 3-23 *Making vertical parallel lines*

Parallel lines at angles can be created by using the 30°–60° and 45° triangles in combination much the same as they are used for making angular lines. When one uses triangles to create angular lines, the first line is created at the desired angle. Aligning one edge of a triangle to the line, register any side of the second triangle against one of the nonaligned edges of the first triangle. Holding the second triangle to prevent it from moving and sliding the first triangle along the engaged edge of the second triangle will reposition the originally aligned edge to any desired parallel position. Successive parallel lines are created in the same way, *Figure 3-24.*

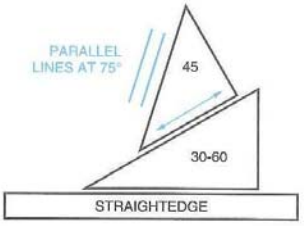


FIGURE 3-24 *Creating successive parallel lines*

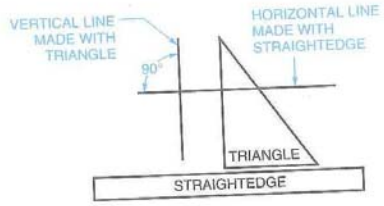


FIGURE 3-25 *Making perpendicular lines*

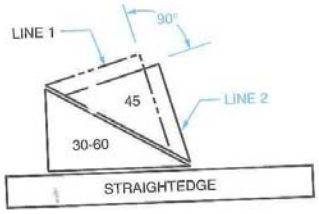


FIGURE 3-26 *Creating a line perpendicular to a nonvertical or nonhorizontal line*

Perpendicular Lines

Drawing perpendicular lines can be accomplished in a manner similar to drawing parallel lines. Horizontal and vertical perpendicular lines can be created using a straightedge and a triangle, *Figure 3-25.*

Creating a line perpendicular to a nonhorizontal or nonvertical line is accomplished by using triangles in conjunction with a straightedge, *Figure 3-26.* Line 1 in this figure is drawn first. Then the 45° triangle is slid along the 30°–60° triangle, and the perpendicular line is created with the opposite side of the 45° triangle.

Sketching

Even in the world of high technology and computers, sketching is still one of the most important skills for drafters and designers. Sketching is one of the first steps in communicating ideas for a design, and it is used in every step thereafter. It is common practice for designers to prepare sketches that are turned over to drafters for conversion to finished working drawings. *Figure 3-27* is an example of a typical design sketch.

Sketching Lines

The lines used in creating sketches closely correspond to those used in creating technical drawings except, of course, that they are not as sharp and crisp. *Figure 3-28* illustrates the various types of lines used in making sketches.

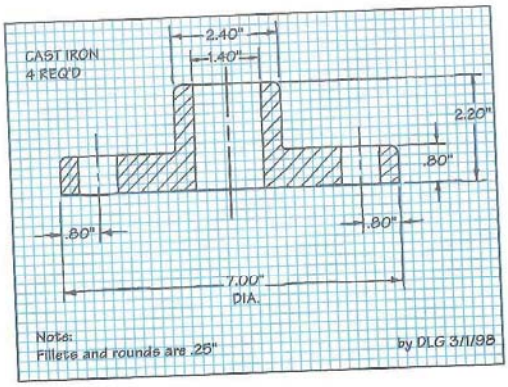


FIGURE 3-27 *Typical design sketch*

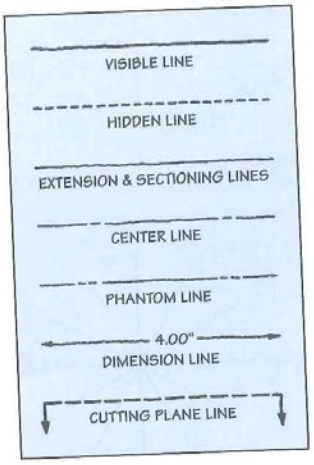


FIGURE 3-28 *Lines used in sketching*

The basic line types are: visible line, hidden line, center line, dimension line, sectioning line, extension line, and cutting plane line. These lines represent the various lines available for creating sketches. The character of each line, as illustrated in *Figure 3-29,* should be closely adhered to when making sketches.

Types of Sketches

The types of sketches correspond to the types of technical drawings. There are four types of sketching: orthographic, axonometric, oblique, and perspective, *Figures 3-30, 3-31, 3-32,* and *3-33.*

Orthographic sketching relates to flat, graphic facsimiles of a subject showing no depth. Six principal views of

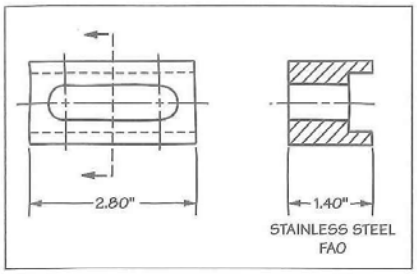


FIGURE 3-29 *Sample design sketch*

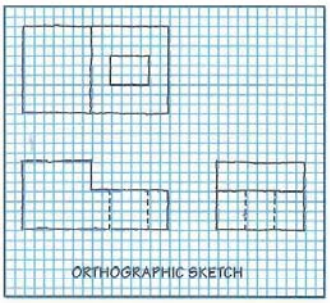


FIGURE 3-30 *Orthographic sketch*

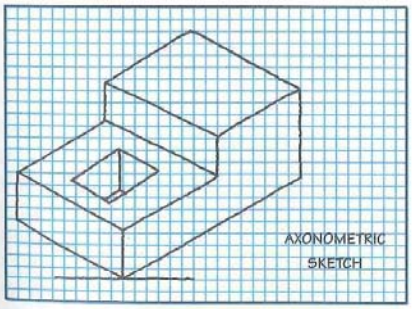


FIGURE 3-31 *Axonometric sketch*

a subject may be incorporated in an orthographic sketch: top, front, bottom, rear, right side, and left side, *Figure* 3-34. The views selected for use in a sketch depend on the nature of the subject and the judgment of the sketcher.

Axonometric sketching may be one of three types: isometric, dimetric, or trimetric, ***Figure*** 3-35. The type most frequently used is *isometric,* in which length and width lines recede at 30° to the horizontal and height

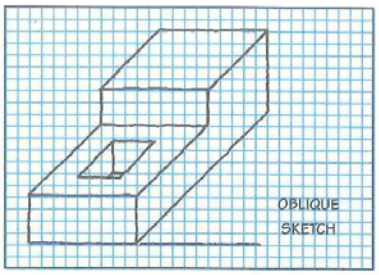


FIGURE 3-32 *Oblique sketch*

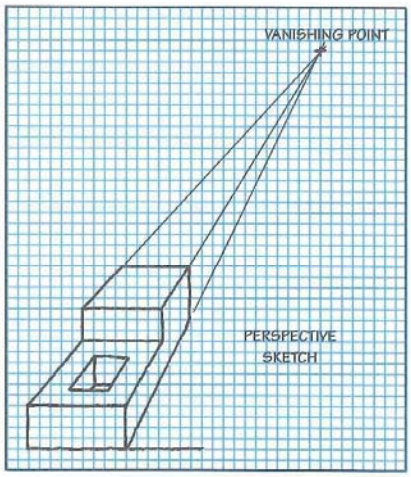


FIGURE 3-33 *Perspective sketch*

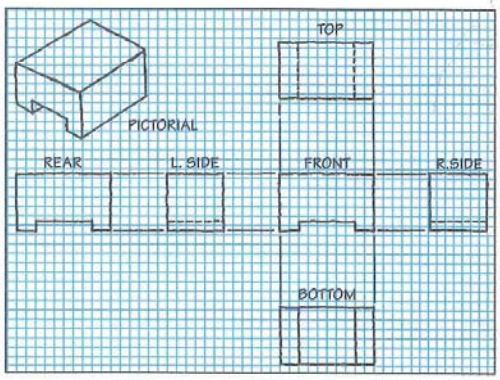


FIGURE 3-34 *Six principal views in orthographic sketching*

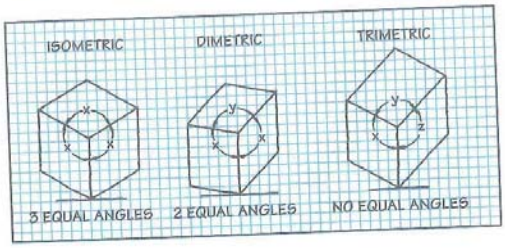


FIGURE 3-35 *Three types of axonometric sketches*

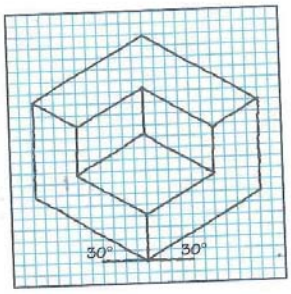


FIGURE 3-36 *Isometric sketch*

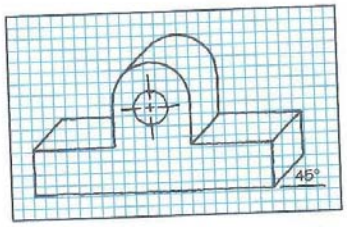


FIGURE 3-37 *Oblique sketch*

lines are vertical, *Figure* 3-36. In sketching, the use of these terms is academic as they relate to proportional scales and angle positions of height, width, and depth, which are only estimated in sketching.

Oblique sketching involves a combination of a flat, orthographic front surface with depth lines receding at a selected angle of 30°, 60° or 45° (usually 45°), *Figure* 3-37.

Perspective sketching involves creating a graphic facsimile of the subject. Consequently, depth lines must recede to a hypothetical vanishing point (or points), *Figures* 3-38 and 3-39. In fact, all pictorial sketches naturally tend to assume characteristics of perspective sketches as a result of how the eye views the apparent relative proportions of objects. This is not necessarily undesirable.

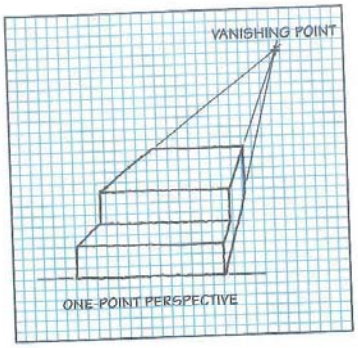


FIGURE 3-38 *One-point perspective sketch*

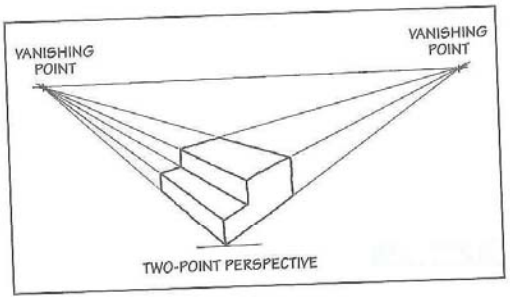


FIGURE 3-39 *Two-point perspective sketch*

Sketching Materials

An advantage of sketching is that it requires very few material aids. Whereas drafters must have a complete collection of tools, equipment, and materials in order to do working drawings, sketching requires nothing more than a pencil and a piece of paper. It is not uncommon for a sketch to be drawn on a paper napkin during a hurried luncheon meeting.

Sketching done in an office environment requires three basic materials: pencil, media (paper or graph paper), and an eraser. Graph paper simplifies the sketching process considerably, especially for students just learning, and it should be used freely.

Sketching Techniques

Sketches, as with drawings, consist of straight and curved lines. With practice, drafters can become skilled in creating neat, sharp, clear examples—straight or curved—of

Industry Application

SKETCHING ABILITY LEADS TO PROMOTION

"Don't they teach sketching in school any more? I can't find one drafting technician in this department who can make a decent sketch." Dan Johnson, chief drafter for Precision Machining, Inc. (PMI), had been frustrated when he made this statement. The problem he had faced at the time was simple. He needed to send a drafting technician into the field to make sketches of several parts for a warehouse full of machines that were to be refurbished and retrofitted. PMI had a contract to machine the parts. Unfortunately, the machines were old enough that technical drawings of the parts were no longer available.

Johnson's only option was to send a drafting technician to the warehouse armed with a sketch pad and micrometers. The parts would be measured, sketches would be made, and the drafting department would have the information needed to create a new technical drawing package. It was after seven technicians in a row had told Johnson that they either never learned sketching or had forgotten how that the chief drafter had vented his frustration. Fortunately for Johnson, Maria Sims overheard him. Sims was PMI's newest junior drafting technician, having graduated from Clark County College of Technology just a month earlier. Sims told Johnson that not only could she make comprehensive, accurate, readable sketches, but that she could read a micrometer, too. She was given the assignment on the spot and her sketching skills served her well.

Johnson was so impressed with his newest junior drafting technician that he not only promoted her, he asked her to give the entire department a seminar on sketching.

all the various line types introduced previously. When sketching, the following general rules apply.

1. Hold the pencil firmly, but not so tightly as to create tension or hand fatigue.
2. Grip the pencil approximately one inch to one and one-half inches up from the point.
3. Maintain a comfortable angle between the pencil and the sketching strokes.
4. Draw horizontal lines from left to right using short, slightly overlapping strokes.
5. Draw vertical lines from top to bottom using short, slightly overlapping strokes.
6. Draw curved lines using short, slightly overlapping strokes.

In addition to these general rules, some specific techniques are used in making the various line types for sketching.

Sketching Straight Lines and Curves

Making straight lines on graph paper is a simple process of guiding the pencil using the existing lines. If graph paper is not available, pencil dots can be positioned to plot the path of the line, ***Figure 3-40***. In this figure, the sketcher enters a series of pencil dots on the paper that provide a basic outline of the shape of the object. Then, with a series of short, slightly overlapping strokes, the pencil dots are connected, ***Figures 3-41, 3-42,*** and ***3-43***. This technique is also used for curved lines, ***Figure 3-44***.

FIGURE 3-40 *Dots used as guides in sketching*

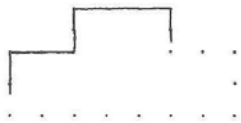


FIGURE 3-41 *Using dots in sketching lines*

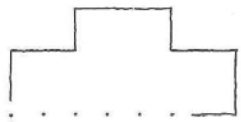


FIGURE 3-42 *Continuing the sketch by connecting the dots*

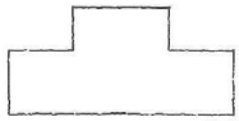


FIGURE 3-43 *Completing the sketch made by using dots as guides*

FIGURE 3-44 *Using dots in sketching curved lines*

Sketching Circles

Figure 3-45 illustrates a series of six steps that can be used for sketching a circle. Vertical and horizontal center lines are sketched, which positions the center of the circle (Step 1), and the radial distances of the desired circle size are marked on each of these lines, equidistant from the center (Step 2). A square is drawn symmetrically around the center, with the sides located at the radial line marks (Step 3). On the diagonals of the square (Step 4), the radial distances are again marked off from the center (Step 5). This provides four positions for the circumference to pass through at the sides of the square, and four more positions on the diagonals of the square. The right half of the circle is sketched in from top to bottom using short, slightly overlapping strokes, and then the left half is sketched in the same manner (Step 6).

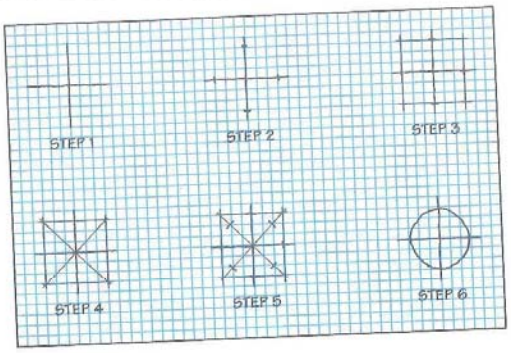


FIGURE 3-45 *Sketching a circle*

Sketching Ellipses

A similar technique is used for sketching ellipses on an orthographic view, except that the square becomes a rectangle, *Figure* 3-46. Ellipses are oriented on the pictorial of the object being sketched as shown in the diagram in *Figure* 3-47.

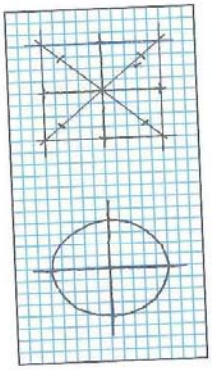


FIGURE 3-46 *Sketching an ellipse*

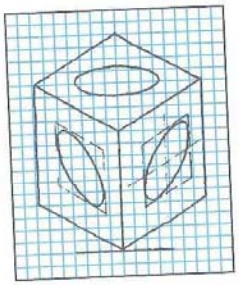


FIGURE 3-47 *Orienting an ellipse on an object*

Proportion in Sketching

Sketches are not done to scale, but it is important that they be made proportionately accurate. All of the various components of a sketch should be kept in proportion to those of the actual object. This technique takes a great deal of practice to master.

Some methods for achieving proportion recommend using a pencil or a strip of paper as a simulated scale. These techniques are not only unrealistic in terms of the real world, they defeat the very purpose of sketching. A skilled sketcher must learn to maintain proportion without the use of tools and aids. The best device for accomplishing proportion in sketching is the human eye. With practice, the drafter can become proficient in maintaining proportion without the use of extraneous, time-consuming devices. The following general rules relating to proportion will also help.

STEP 1 In sketching, use graph paper whenever possible.

STEP 2 Examine the object to be sketched and mentally break it into its component parts.

STEP 3 Beginning with the largest components (width and height), estimate the proportion, such as the width is 4/3 times the height or 5/2 times the height, and so on.

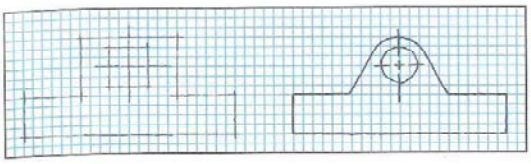


FIGURE 3-48 *Blocking in components*

STEP 4 Lay out the largest component according to the proportions decided upon in Step 3. Use construction line squares and rectangles to block in irregularly shaped components, *Figure 3-48.*

Repeat Steps 3 and 4 until the entire object is finished.

Orthographic Sketching

Orthographic sketching may involve sketching any combination of the six principal views of the subject. The top, front, and right-side views are normally selected for representing an object in an orthographic sketch. However, these views are not always appropriate. The sketcher must learn to choose the most appropriate views. These are the views that show the most detail and the fewest hidden lines. A good rule of thumb to use in selecting views is to select the views that would give you all of the information you would need if you had to make the object yourself.

Once the views have been selected, the orthographic sketch may be laid out using the techniques set forth earlier in this chapter. To ensure that the sketched views align, the entire sketch should be blocked in before adding details, *Figure 3-49.* Once the layout is blocked in, the details can be added one view at a time, *Figures 3-50, 3-51,* and 3-52.

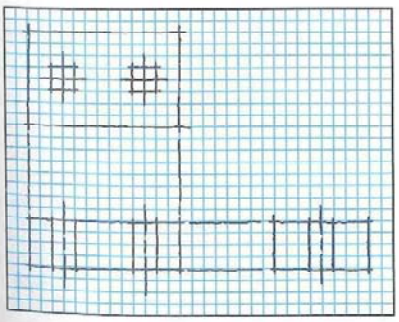


FIGURE 3-49 *Blocking in an orthographic sketch*

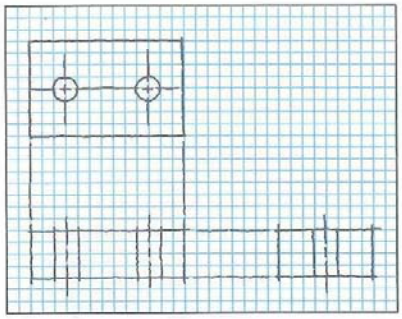


FIGURE 3-50 *Completing the top view*

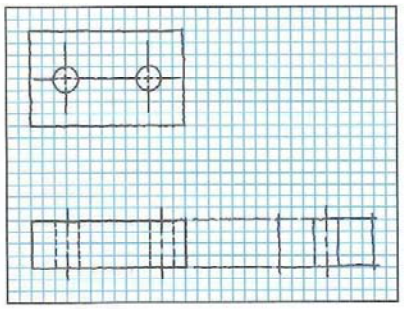


FIGURE 3-51 *Completing the front view*

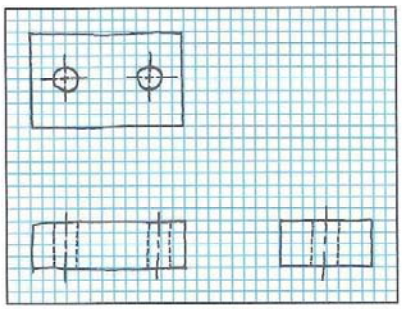


FIGURE 3-52 *Completing the sketch*

Axonometric Sketching

As was mentioned earlier, there are three types of axonometric projection: isometric, dimetric, and trimetric. Isometric projection is used in sketching. Dimetric and trimetric projection have little application in sketching, due to the difficulty in proportioning scale values of

depth, width, and height. Isometric views have the same scaling value in all three directions, eliminating the need to vary proportions among the three directions. In an isometric sketch, height lines are vertical, and width and depth lines recede at approximately 30° and 150° (180°–30°) from the horizontal.

The first step in creating an isometric sketch is to lay out the isometric axis, *Figure* 3-53. All normal lines will be parallel to one of the axis lines. The next step is to block in the object using construction lines, *Figure* 3-54. Five steps in the development of an isometric sketch are shown in *Figures* 3-55, 3-56, 3-57, 3-58, and 3-59.

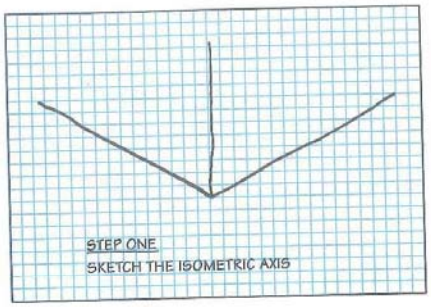


FIGURE 3-55 *Step 1 in making an isometric sketch*

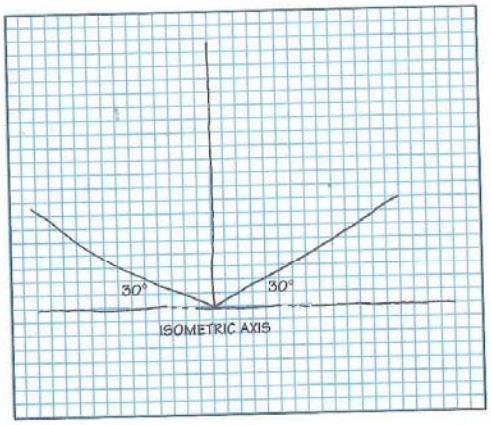


FIGURE 3-53 *The isometric axis in sketching*

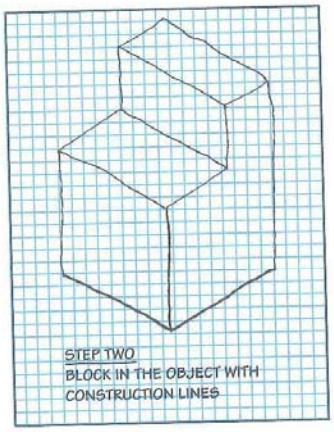


FIGURE 3-56 *Step 2 in making an isometric sketch*

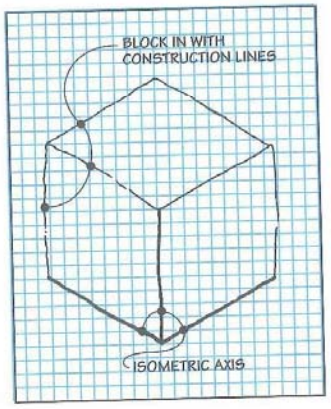


FIGURE 3-54 *Blocking in the object*

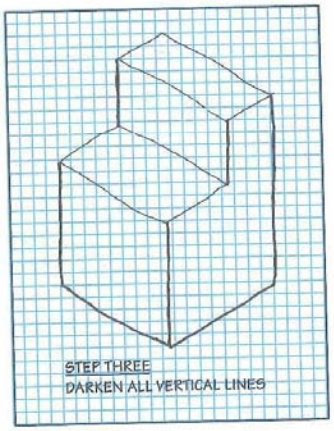


FIGURE 3-57 *Step 3 in making an isometric sketch*

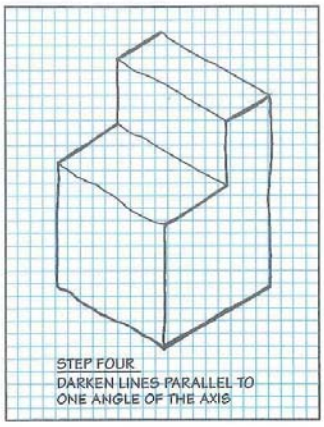


FIGURE 3-58 *Step 4 in making an isometric sketch*

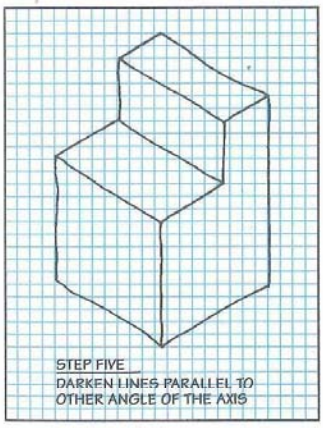


FIGURE 3-59 *Step 5 in making an isometric sketch*

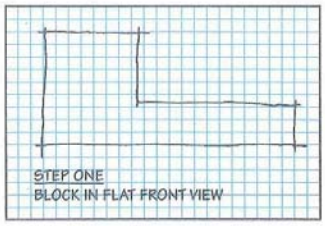


FIGURE 3-60 *Step 1 in making an oblique sketch*

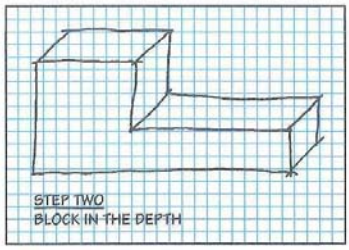


FIGURE 3-61 *Step 2 in making an oblique sketch*

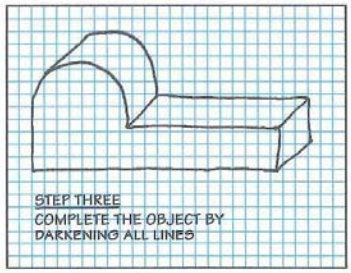


FIGURE 3-62 *Step 3 in making an oblique sketch*

Oblique Sketching

Oblique sketching involves laying out the front view of an object and showing the depth lines receding at an angle (usually 45°) from the horizontal. Oblique sketching is particularly useful for dealing with an object having round components. Oblique sketching allows round components to be drawn round, rather than elliptical.

Using the blocking-in method, the flat front surface of the object is laid out. The depth is then blocked in using parallel lines, and the sketch is completed by outlining the exposed profile of the rear surface. *Figures 3-60*, 3-61, and 3-62 illustrate three steps in creating an oblique sketch.

Perspective Sketching

Perspective sketching closely approximates how the human eye actually sees an object. Two common types of perspective sketches are one-point and two-point perspectives.

A one-point perspective sketch is similar to an oblique sketch, except that depth lines recede to a vanishing point instead of receding parallel to one another, *Figure 3-63*. In constructing a one-point perspective, the following procedures apply.

STEP 1 Lay out the flat front surface of the object using the blocking-in method, *Figure 3-64*.

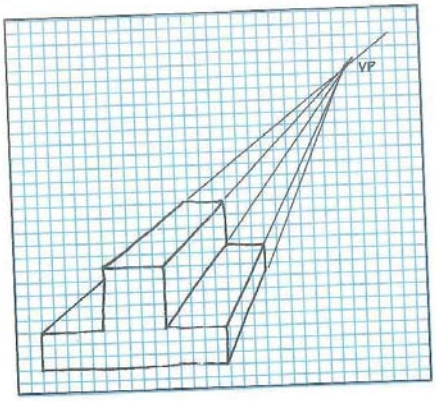


FIGURE 3-63 *One-point perspective sketch*

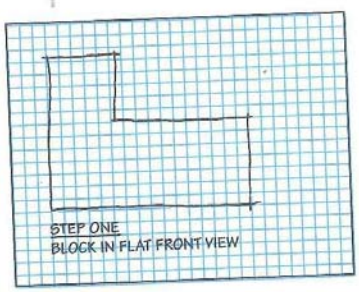


FIGURE 3-64 *Step 1 in making a one-point perspective sketch*

STEP 2 Select and mark a single vanishing point. Project all points on the front surface back to the vanishing point, *Figure 3-65*.

STEP 3 Estimate the depth of the object and mark it off on all line projectors, *Figure 3-66*.

STEP 4 Complete the sketch by outlining the exposed profile of the rear surface, *Figure 3-67*.

A two-point perspective resembles an isometric sketch, except that width and depth lines recede to the left and right vanishing points rather than receding in parallel, *Figure 3-68*.

In constructing a two-point perspective, the following procedures apply.

STEP 1 Lay out the two-point perspective frame, which consists of the vertical height line, the vanishing point left, the vanishing

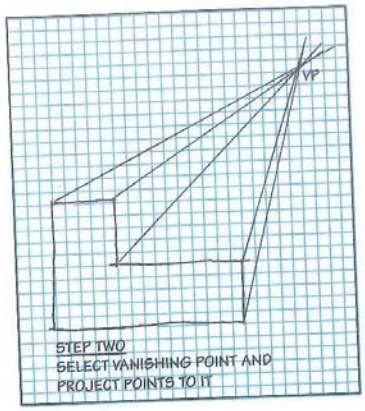


FIGURE 3-65 *Step 2 in making a one-point perspective sketch*

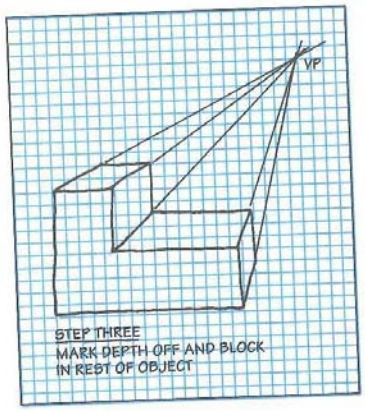


FIGURE 3-66 *Step 3 in making a one-point perspective sketch*

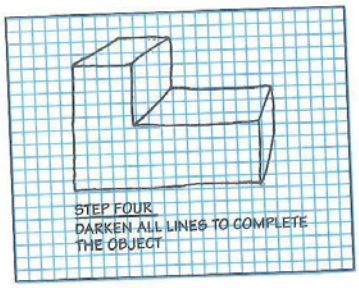


FIGURE 3-67 *Step 4 in making a one-point perspective sketch*

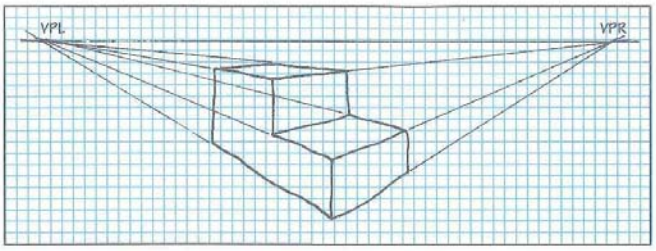


FIGURE 3-68 *Two-point perspective sketch*

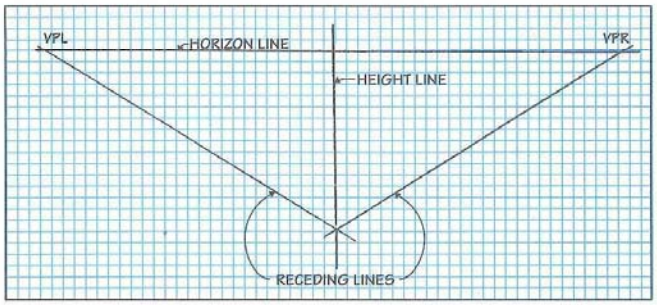


FIGURE 3-69 *Laying out the two-point perspective frame*

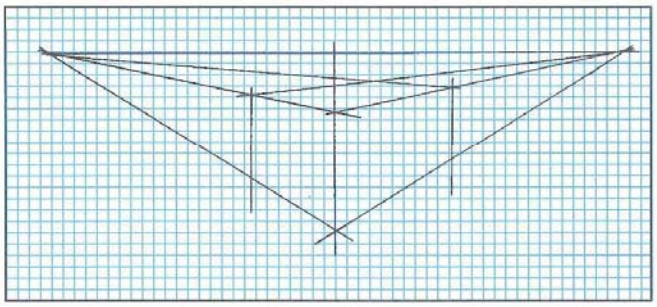


FIGURE 3-70 *Blocking in the object*

point right, and the receding lines (all estimated locations), *Figure 3-69*. The horizon line when positioned below the view provides a view of the bottom of the object, and when positioned above it shows the top. The vanishing points must be on the horizon.

STEP 2 Block in the object, estimating the length and width for proportion, *Figure 3-70*.

STEP 3 Lay out the details, lightly giving special attention to proportion, *Figure 3-71*.

STEP 4 Complete the two-point perspective sketch, *Figure 3-72*.

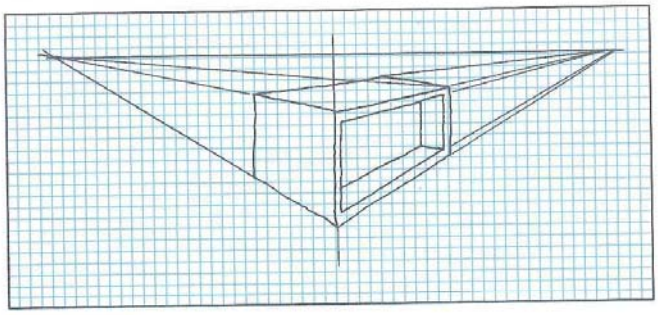


FIGURE 3-71 *Laying out the details*

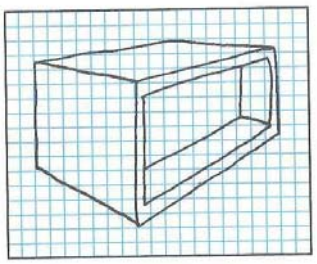


FIGURE 3-72 *Completing the two-point perspective sketch*

Summary

- Talking sketching is of two types; conversational and boardroom sketching. Conversational sketches are developed as two or three individuals discuss an idea. Boardroom sketches are developed on a marker board, chalkboard, or flip chart while a group discusses an idea.
- Freehand lettering may be done in several styles including Block, Fast, Futura, Leroy, Old English, Times, and Helvet. Single-stroke Gothic lettering may be done in upper- or lowercase, extended or condensed, and vertical or inclined styles. The characteristics of good lettering are neatness, uniformity, stability, proper spacing, and speed.
- Students should be able to make and demonstrate the proper use of the following types of lines: visible, hidden, crosshatching, center, dimension, extension, leader, cutting plane, freehand break, mechanical break, phantom, and stitch.
- Students should be able to illustrate the following types of sketches: orthographic, axonometric, oblique, and perspective.
- The materials needed for making sketches are pencils, paper or graph paper, and an eraser.
- Sketching techniques with which students should be proficient are making straight lines, curves, circles, and ellipses. Students should also be proficient in maintaining proper proportion when sketching.

Review Questions

Answer the following questions either true or false.

1. The standard style of freehand lettering on technical drawings is vertical, single-stroke Arial.
2. The correct slope of slanted lettering is a two-unit incline to the right for each five units of letter height.
3. Three strokes are required to make the letter B.
4. In regard to space left between words, it is a rule of thumb to leave the width of one round letter such as Q, C, or O.
5. Uniformity, neatness, and stability can all be achieved without using guidelines.
6. A setting of 8 on a lettering guide will produce letters 1/4" high.
7. *Line work* is a term used to describe one specific technique used to create graphic data on technical drawings.

Answer the following questions by selecting the best answer.

1. Which of the following is not a characteristic of good freehand lettering?
   a. Neatness
   b. Speed
   c. Uniformity
   d. Incline