

SUBCOURSE

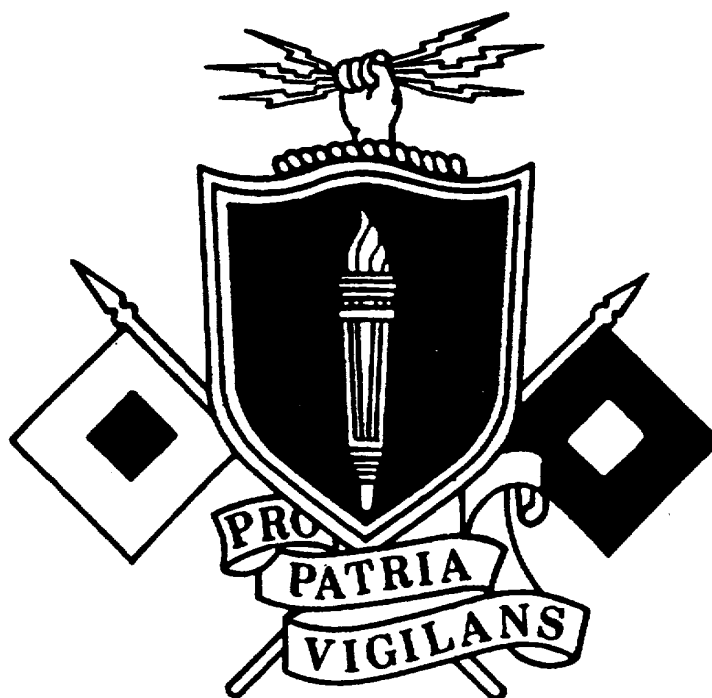
SS0525

EDITION

A

LETTERING TECHNIQUES

EDITION DATE: SEPTEMBER 1994



THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT
ARMY CORRESPONDENCE COURSE PROGRAM

A
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P
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READINESS /
PROFESSIONALISM



THRU
GROWTH

LETTERING TECHNIQUES

Subcourse Number SS0525

EDITION A

United States Army Signal Center and School
Fort Gordon, GA 30905-5074

5 Credit Hours

Edition Date: September 1994

SUBCOURSE OVERVIEW

This subcourse presents the procedures and techniques you will use in lettering. It provides the methods used in classifying letters and describes freehand lettering using several lettering tools. This subcourse also identifies the various applications of mechanical, prepared, and computer-generated lettering.

There are no prerequisites for this subcourse.

This subcourse reflects the doctrine which was current at the time it was prepared. In your own work situation, always refer to the latest official publications.

Unless otherwise stated, the masculine gender of singular pronouns is used to refer to both men and women.

TERMINAL LEARNING OBJECTIVE

- ACTION: You will identify and describe the procedures for letter classification, lettering principles, freehand lettering, and mechanical and prepared lettering techniques.
- CONDITION: You will be given information from Naval Education and Training (NAVEDTRA) Illustrator Draftman Manual 10472.
- STANDARD: To demonstrate competency of this task, you must achieve a minimum score of 70% on the subcourse examination.

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LESSON I

INTRODUCTION TO LETTERING

Critical Task: 113-579-1037

OVERVIEW

LESSON DESCRIPTION:

In this lesson you will learn the purpose and method of classifying letters. You will also learn the principles necessary to construct letters using guidelines and grids.

TERMINAL LEARNING OBJECTIVE:

- ACTIONS:
- a. Describe the classification of letters.
 - b. Describe the principles necessary to construct letters.
 - c. Identify the basics of lettering strokes.
 - d. Describe how to use guidelines and a grid.
- CONDITION: You will be given information from NAVEDTRA Illustrator Draftsman Manual 10472.
- STANDARD: You will identify the classification of letters and describe the basic strokes to construct letters in accordance with NAVEDTRA Illustrator Draftsman Manual 10472.
- REFERENCES: The material contained in this lesson was derived from the following publication: NAVEDTRA Illustrator Draftsman Manual 10472.

INTRODUCTION

Lettering, not printing, is the correct term for producing letters by hand. Printing involves the use of a printing press. You draw lettering either by hand or by some mechanical means, such as a Leroy set. Lettering is not new. Before the invention of the printing press, all documents were produced by lettering. Lettering is an art form and the design of modern letters have, Egyptian hieroglyphics as their root. Across the ages, letters were modified to suit the talent and taste of the artist. Later in this lesson you will be exposed to various types, of letters in use today.

PART A - LETTER CLASSIFICATION

1. Lettering.

As a graphics documentation specialist, you are required to demonstrate proficiency by lettering diverse projects that vary from simple name plates for military housing to complex presentation materials. There is only one way to become proficient at lettering--practice. All projects you letter are some form of communication (e.g., the name plate tells or communicates who dwells in the quarters; presentations communicate ideas). For a lettering project to communicate effectively it must, above all else, be legible. The following list includes the lettering factors, discussed later in this subcourse, that have the greatest bearing on legibility.

- a. Style of letter.
- b. Size of letter.
- c. Space between letters.
- d. Space between words.
- e. Space between lines.

2. Letter Classification.

a. Introduction. As mentioned earlier, lettering is a form of communication. Words alone do not convey the entire message. Letter size, style, and other characteristics also help to convey a message. Consider how these factors are used in some documents to which you are exposed.

(1) The style of letters in part, determines how readable a document is. For this reason, magazine articles use letter styles that are easy to read. The size of letters can attract the readers' attention, such as headlines in a newspaper or titles on charts. The size and style of letters is often used to deter a person from reading the "fine print."

(2) Properly used, letter styles convey the feeling or mode of the message you are communicating. They may be warm, brisk, dignified, modern, old-fashioned, or some other variation. To select the style appropriate to the message, you must be able to recognize various styles and be familiar with their appropriate use.

(3) Letter styles are often referred to as faces. Figure 1-1 displays the six main classes of letters commonly

used today. In general, all letters are classified as one of the six displayed in figure 1-1.

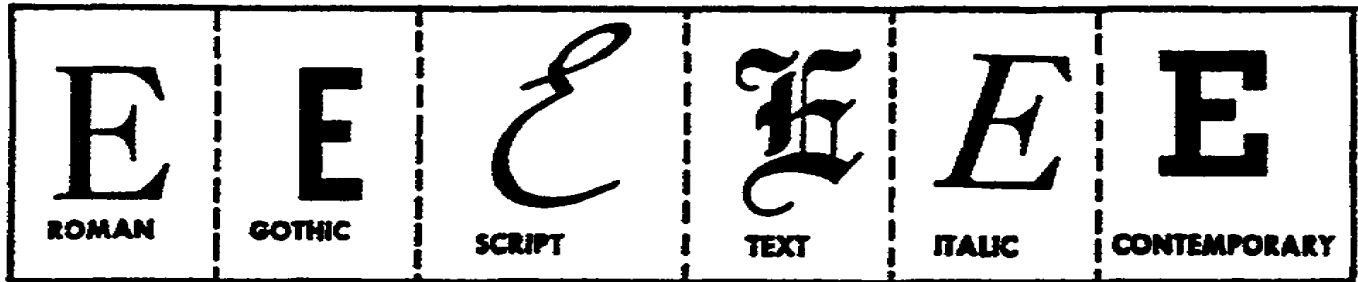


Figure 1-1. Six classes of letters

(a) Divide each letter style into two groups, capital letters and small letters. You can refer to capital letters as upper-case and small letters as lower-case.

(b) These designations come down from the time when all typesetting was performed by hand. The typesetters divided the letters and put them into two types of cases. In the upper case they stored the capital letters and put the small letters in the lower case.

b. Roman. Ancient Romans developed and refined our capital (or upper-case) letters. These ancient artists carved letters in stone. As a guide, they painted the letters to be carved using a flat brush always held at the same angle. When they moved the brush vertically, it made a thick stroke. When they moved it horizontally, it made a thin stroke. As a result, Roman letters are composed of thick vertical strokes and thin horizontal strokes. The thin lines have cross-strokes at the end. These cross-strokes are called serifs. Serifs lend unity to Roman letters, blend them together, and make them easy to read.

(1) Old style and modern are the two classifications of Roman types. The chief means of distinguishing between these two classifications is the serif. Refer to figure 1-2 and compare the serifs. Notice that the old style letter has softer and more rounded serifs while the serifs on the modern letter are sharper and the horizontal lines are thinner than the old style.

(2) Roman letters are most commonly used for the text of magazines, newspapers, and books. It was chosen for these purposes because most people are familiar with it and because Roman letters are the easiest to read, particularly in small size and lengthy articles. Some qualities attributed to Roman letters are: dignity, refinement, and stateliness. Figure 1-2

provides a comparison between the old style and modern Roman typefaces.



Figure 1-2. Comparison between old style and modern Roman

c. Gothic. Refer to figures 1-3 and 1-4. Compare the Gothic style to the Roman style. Observe that both the horizontal and vertical strokes are the same thickness on the Gothic style, and that it does not have any serifs. The Gothic style letter is plain. Because of its simplicity, refer to the Gothic letter as the block letter. Refer to figure 1-4.

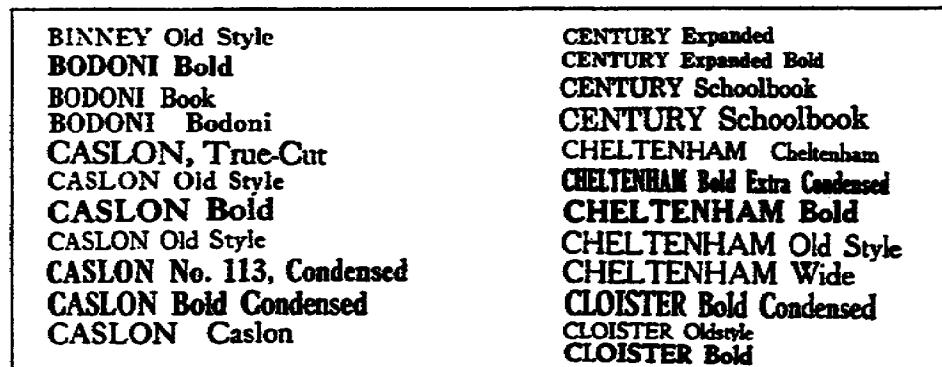


Figure 1-3. A sample of Roman style letters

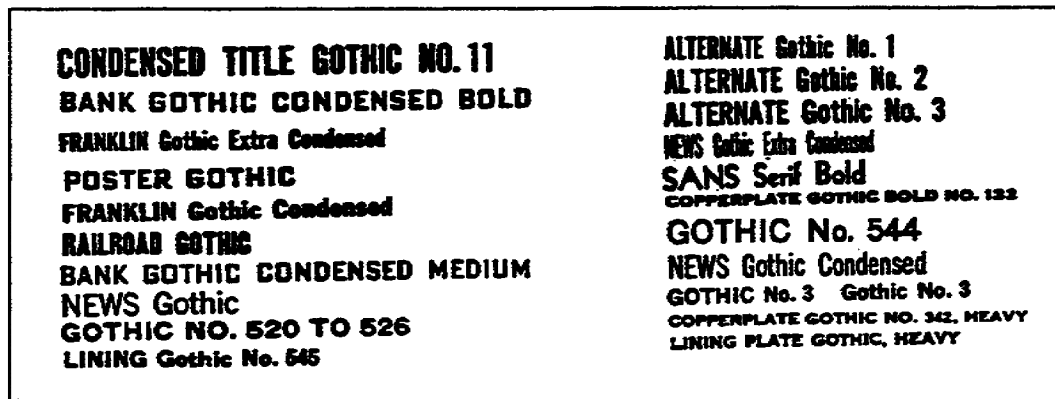


Figure 1-4. A sample of Gothic typefaces

The sans-serif Gothic face shown in figure 1-4 is in common use today. Compare the Roman typefaces shown in figure 1-3 with the Gothic typefaces shown in figure 1-4. Notice that the Roman face is easier to read than the Gothic face, particularly in the smaller sizes. You can use Gothic style letters in a wide variety of applications today. The following paragraphs list a few of these applications.

(1) You generally use Copperplate Gothic for letterheads, envelopes, cards, announcements and many types of official forms.

(2) Use News Gothic in the body of newspapers for titles and headings.

(3) You primarily use Franklin Gothic, Alternate Gothic, and Poster Gothic to letter display work. They are popular for posters and as headers on viewgraphs, charts, and tables.

d. Script and Cursive. Script and cursive (a style of printed letter that imitates handwriting) type are classified together. Script letters have small connecting links called kerns that link the letters together giving the lettering an appearance of handwriting. Cursive letters do not have these kerns. Refer to figure 1-5 and compare the Bernhard Cursive style with the Ariston Bold style. Notice that the Ariston Bold more closely resembles handwriting than does the Bernhard Cursive. This is because the Ariston has kerns, while the Bernhard does not. Cursive type is patterned after old-fashioned hand lettering, while script imitates the old slanting handwriting.

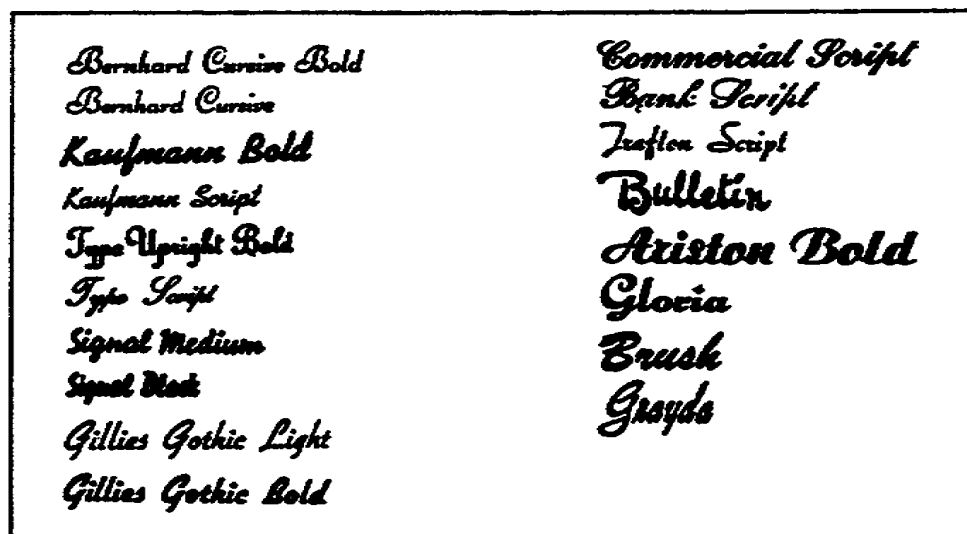


Figure 1-5. Script and cursive typefaces

(1) Both script and cursive have the characteristics of elegance and charm. For these reasons, a common use is to letter invitations and announcements. You also use them to lend elegance to display work.

(2) Figure 1-5 illustrates some of the variations of script letters in use today.

e. Text. Text is also referred to as "old English." Text was among the first type styles used. It is both difficult to read and to construct by nonmechanical methods. Words consisting of all capital letters in either script or text are virtually illegible. Their most common application is religious in nature such as prayer books. Another common use is as titles of certificates. Limit the use of this style to a few lines and avoid works with all capital letters such as those shown in the last lines of figure 1-6. Figure 1-6 displays some of the variations of text letters in use today.

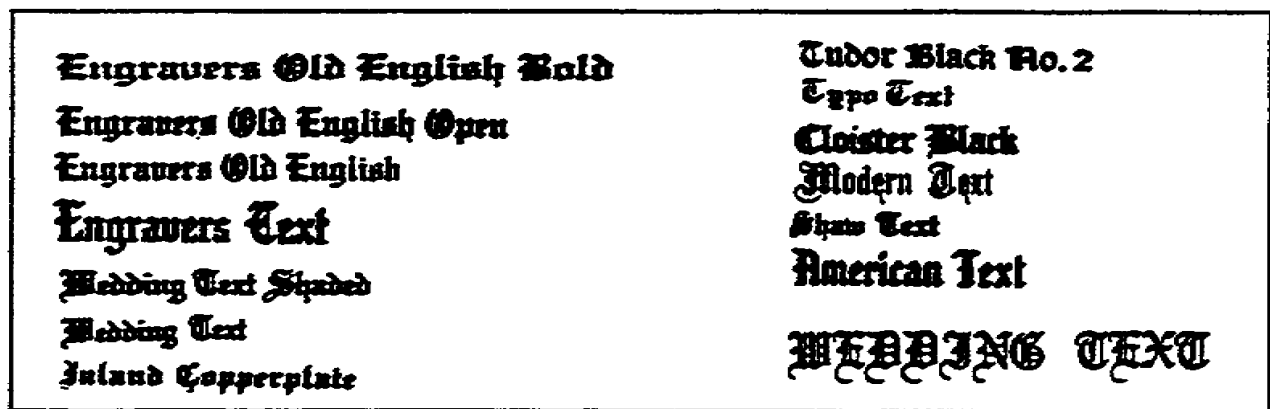


Figure 1-6. Text typefaces

f. Italics. Italics is not a style in and of itself, but a variation of Roman, Gothic, Contemporary, and certain other lettering styles. Italics are slanting versions of letter styles. Refer to figure 1-7 and compare the Copperplate Gothic italic style to the Copperplate Gothic style shown in figure 1-4. Use italics to add contrast and interest to lettering projects. One common use of italics is to draw interest (emphasize) to that portion of the project lettered in italics. You also use italics to identify water features on maps. Italics were originally used for text. However, this variation is rather difficult to read in lengthy articles and have fallen into disuse for this purpose. You will learn more about italics later in this lesson.

BENEDICTINE Book Italic
FUTURA Bold Condensed Oblique
FUTURA Medium Oblique
STYMIE Black Italic
SPARTAN Medium Italic

GARAMOND Bold Italic
GOUDY Handtooled Italic
COPPERPLATE GOTHIC ITALIC
BOOKMAN Old Style Italic
CHELtenham Bold Italic

Figure 1-7. Varieties of italics

g. Swash Lettering. Another style variation is swash lettering. They are similar to italics but they are embellished with swirls and curves called swashes. They provide an alternative to or may be combined with italics as a method of adding contrast, emphasis, or inviting attention to certain portions of a lettering project. Figure 1-8 is an example of swash lettering.

Type No. 16. A soft answer quieteth anguish.

Figure 1-8. Example of swash letters

h. Contemporary. As with many other art forms, fads creep into lettering. New styles come and go. Some new styles catch on and endure while others experience a relatively short, useful life. Two distinctly new styles that are gaining in popularity are the square serif and the sans-serif. The sans-serif closely resembles Gothic. However, sans-serif, unlike Gothic, has balance and near perfect geometric proportion. Because of these characteristics, you may classify sans-serif as a contemporary letter style. Figure 1-9 presents some variations of sans-serif type styles currently in use.

3. Other Letter Characteristics.

a. Families and Type Series. As a professional, you must know the correct terms used within your profession. Always use the correct term when discussing lettering. Thus far, we have discussed the six broad classifications of letters and you have seen examples of each. There are other terms used to classify letters with which you must be familiar. As you have seen from these examples (figures 1-2 through 1-4) there are both similarities and differences between letters within a specific style.

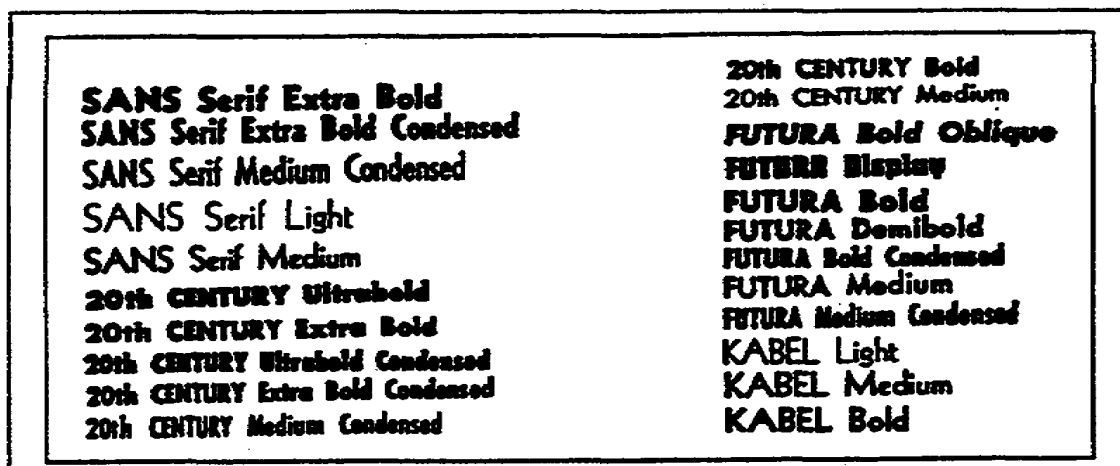


Figure 1-9. Sans-serif typefaces

(1) Families. Typefaces that are similar, though not exactly alike, are grouped into classifications known as families. For example, Gothic is a family of typefaces, not a single typeface. Take another look at figure 1-4.

(2) Type series. Notice that all the typefaces shown in that figure share the elements of Gothic style, yet there are subtle differences between Poster Gothic and News Gothic. Notice also that within a family, a specific family member may vary in size. An example of this is the Bodoni style shown in figure 1-3. All the sizes of a specific family member are called a type series.

b. Type Units of Measure. Type size has two units of measure, points. (height) and pica (line length).

(1) Points are the unit of measure that describes the height of letters. One point is equal to $1/72$ of an inch. For example, a letter $1/2$ inch high ($36/72$) is 36 points, $1/4$ inch high ($18/72$) is 18 points. To determine the height of letters, measure from the top of a capital letter to the bottom of a small letter.

(2) Pica is the unit of measure that describes the length of a line of letters. A pica is $1/6$ of an inch, thus, there are 6 picas to the inch.

c. Weight. Letters are also classified based on the relative weight of the lines you use to construct them. The three weights in general use are light, medium, and bold. There is no unit of measure for these terms.

4. Height to Width Ratio.

Another classification of letters is a function of their height to width. These classifications are condensed and extended.

a. Condensed letters are narrow compared to their width. Use condensed letters when space is limited.

b. Extended letters are wide compared to their height. Use extended letters as a means of adding prominence.

5. Summary.

This concludes the discussion of letter classification. Remember, the selection of letter style, size, and other characteristics are a matter of preference. There are no hard and fast rules. Lettering is a form of communication and above all else, lettering must be legible or the message will be lost.

PART B -LETTERING PRINCIPLES

The overall effectiveness of your work depends strongly on its overall composition. Lettering either by itself, or as part of a presentation, involves properly arranging letters, words, and lines of letters with any other graphics components of the project. In this part of the lesson, you will learn how to space between letters, words, and lines.

6. Spacing Letters.

For any lettering project to appear balanced, the white space (the irregular backgrounds between the letters) must appear equal. This is not an easy task and requires detailed work. Vary the spacing between adjacent letters depending on whether they have straight sides (H/I/M/N), slanted sides (A/V/W), round sides (O/Q/C/G), or open sides (L/J). In the past, several attempts were made to develop hard and fast rules to space letters; however, they were not successful. In general, leave the same amount of white space between letters as appears within the previous letter in the word. Refer to figure 1-10 and pay particular attention to the spacing marks above the letters.

a. Look at line 1 in figure 1-10. All the letters in this line have straight sides; therefore, the spacing between them should be equal. Determine the spacing by the following method. Using a printer's rule, an engineer's rule, or some other scaled device that provides a variety of graduates (inches, centimeters, or any other unit of linear measurement), measure the distance between the insides of the vertical strokes of the first letter in the word. In this case, the capital

letter N. Record this distance. This is the appropriate distance between the letters. Notice that all the letters on line 1 are separated by the amount of white space in the first letter in the group, therefore, they appear to form a word. This procedure works well for spacing between letters with straight sides.

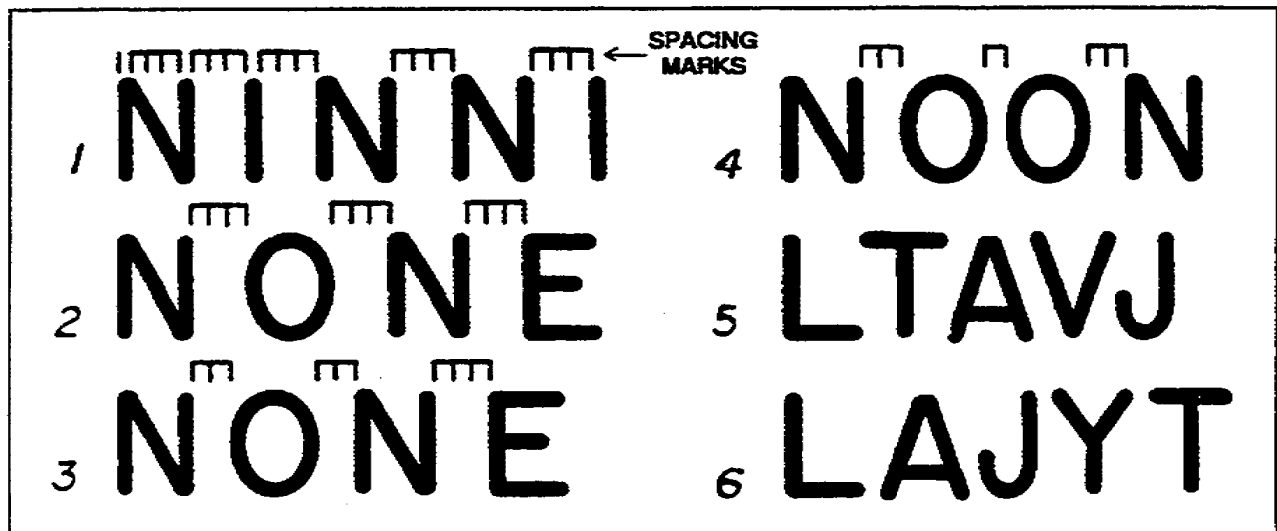


Figure 1-10. Spacing between letters

b. Now refer to line 2 in figure 1-10. This line retains the same spacing as line 1. However, the upper-case letter O does not occupy the same amount of space as the letter N; therefore, the spacing between the letters appears unequal. By reducing the space between the N and O and between the O and the N from three measured units to two measured units, you restore balance. Notice how much better the word "NONE" appears on line 3 than it does on line 2. As a general rule, the space between round letters and straight letters should be less than the space between two straight sided letters.

c. Look at line 4 in figure 1-10. Balance is obtained on this line by reducing the space between two round letters to one measured unit, and retaining the spacing between round and straight letters at two measured units.

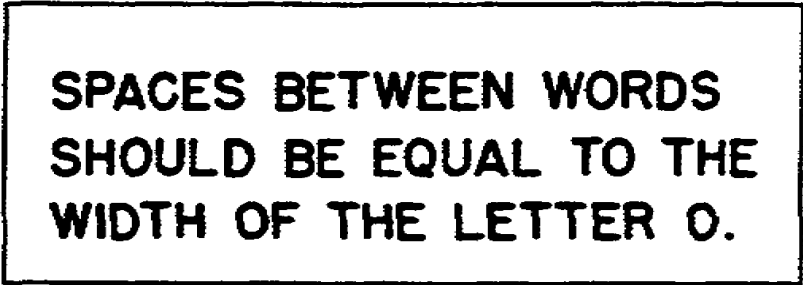
d. Now look at lines 5 and 6 in figure 1-10. The spacing of letters that have odd shapes such as these deserve special attention. Those on line 5 present no particular problems and can even overlap such as the V and J. For such combinations, use your best judgement. Space the letters whichever way best achieves balance. The letters on line 6, however, present some special problems. One way to achieve balance is to shorten the horizontal stroke on such letters as L and T. Again, there are

no hard and fast rules. Use your best judgement and seek the advice of more experienced personnel if they are available to you. When time permits, examine magazine articles and advertisements for other ideas on letter spacing.

7. Word Spacing.

Another issue that impacts on legibility is spacing between words. As with other matters regarding lettering techniques, experts in the field do not always agree on any one approach. Generally speaking, there must be enough space to separate words from one another, but not so much as to cause us to read one word at a time. In general, follow the guidelines specified in figure 1-11.

a. Using the letter O is convenient, the letterer needs only to make a circular movement above the paper next to the preceding word.



**SPACES BETWEEN WORDS
SHOULD BE EQUAL TO THE
WIDTH OF THE LETTER O.**

Figure 1-11. Spacing between words

b. When spacing words, you must consider the characteristics of the last letter in the previous word and those of the first letter in the next word. The following paragraphs provide some techniques to help you achieve proper word spacing.

(1) Leave a space equal to the capital letter O between two half-height, straight-stemmed letters such as H and E, or D and B. If one or both letters are curved, reduce the spacing by about 1/3.

(2) If the two letters are lower-case, use the lower-case letter o using the conditions explained previously.

(3) If one letter is upper-case and one is lower-case, use a space equal to 1/2 of the upper-case O plus 1/2 of the lower-case o. Figure 1-12 is an example of balanced spacing that employs all the techniques discussed thus far in this lesson. This concludes our discussion of word spacing. Next we will discuss line spacing.

8. Line Spacing.

Line spacing is as important to the legibility and overall quality of a project as letter and word spacing. Again, there are no hard and fast rules. However, there are some general guidelines that when combined with your good judgement will help you determine the line spacing appropriate to your project.

a. In general, the line spacing should be between $1/2$ to $1 \frac{1}{2}$ times the height of the letters.

b. Do not use a line spacing equal to the letter height.

c. In general, line spacing that is equal to $2/3$ of the letter height enhances the balance and legibility of your project. Figures 1-13 and 1-14 are both examples of balanced line spacing.

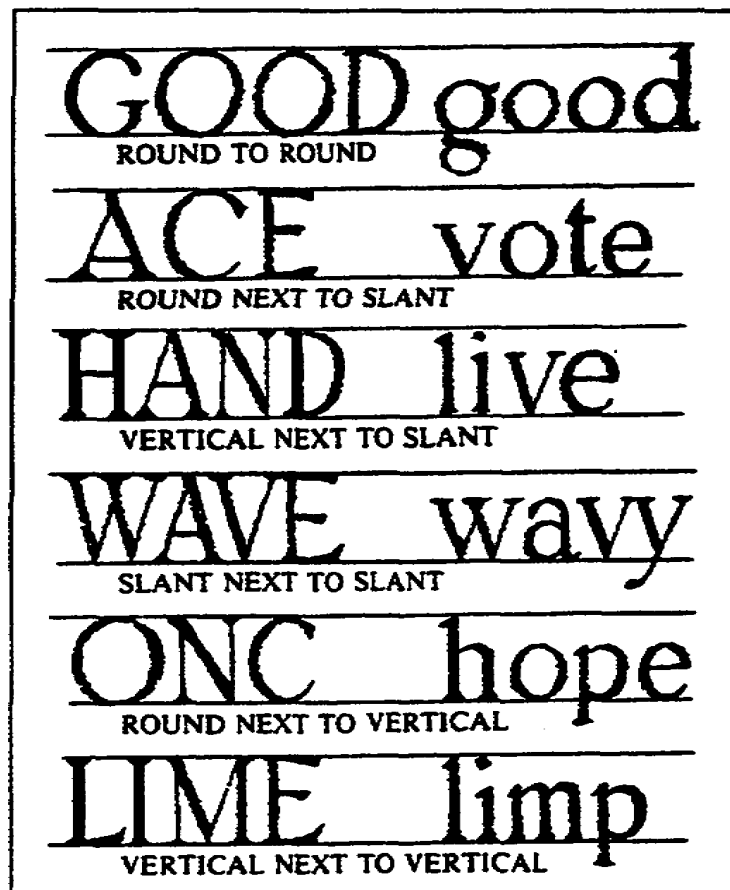


Figure 1-12. Balanced letter spacing

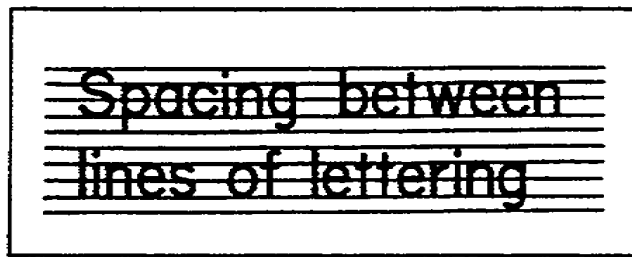


Figure 1-13. Balanced line spacing

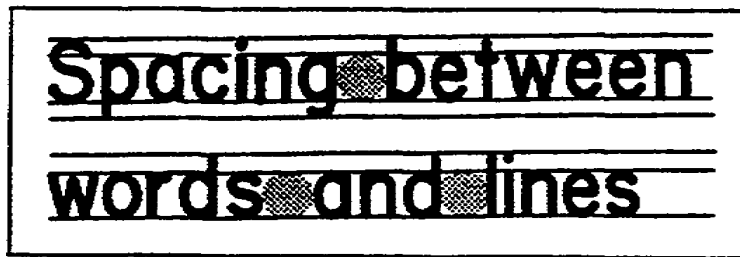


Figure 1-14. Balanced word and line spacing

9. Centering.

The letters of the alphabet vary in width. This characteristic of lettering makes it difficult for the letterer to center a line of text.

a. One method that you can use to minimize this difficulty is to letter the required line of letters on a piece of scratch paper. Then determine and mark its center using a printer's rule or other graduated ruler. Align the center mark on the scratch paper with the center mark on your project and use the scratch paper as a guide to construct your project.

b. Centering lines is an effective means of drawing attention to information. The observer's eye is naturally drawn to centered text. There is a difference between the true center and the optical center. Due to an optical illusion, text located in the true center will appear as if it were below center. To achieve balance in your centered work, do the following:

(1) Determine and mark the exact (true) center. This is the point on the work area that is of equal distance from each corner.

(2) Measure the vertical length of the work area and divide this length by 10. Make a mark on the work above the

true center equal to the distance determined by your calculation. This mark is the optical center of the work area. For example, if the length of your work area is 15, you would place a mark on the work 1 1/2 inches above the true center ($15 \div 10 = 1.5$). Use this mark as the vertical center of your work. The horizontal center is that point of equal distance from each side of the work.

c. Refer to figure 1-15. This figure provides a comparison between work placed in the optical center (the text on the left) with work placed in the true center (the text on the right). Notice that the work in the true center appears below center, while the work in the optical center appears balanced.

10. Distortions and Optical Illusions in Lettering.

The eye is often bothered by certain distorting effects that occur in lettering designs. Many of these effects are of great concern to you as they can cause an otherwise excellent lettering project to appear distorted. One illusion you are probably familiar with is the one that makes certain forms (letters or letter combinations) of the same height appear quite different in height when you place them side by side. One example of this optical illusion is when triangles, circles, and rectangles (or letters that have these shapes) appear side by side. Figure 1-16 demonstrates this illusion. When such an illusion occurs in your work, you must correct it to retain balance and legibility. Employ the following techniques to correct such optical illusions.

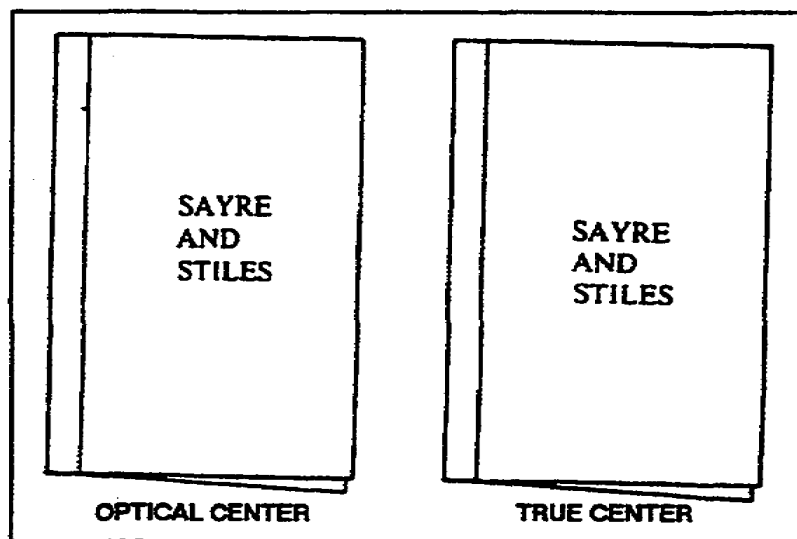


Figure 1-15. Comparison of true and optical centers

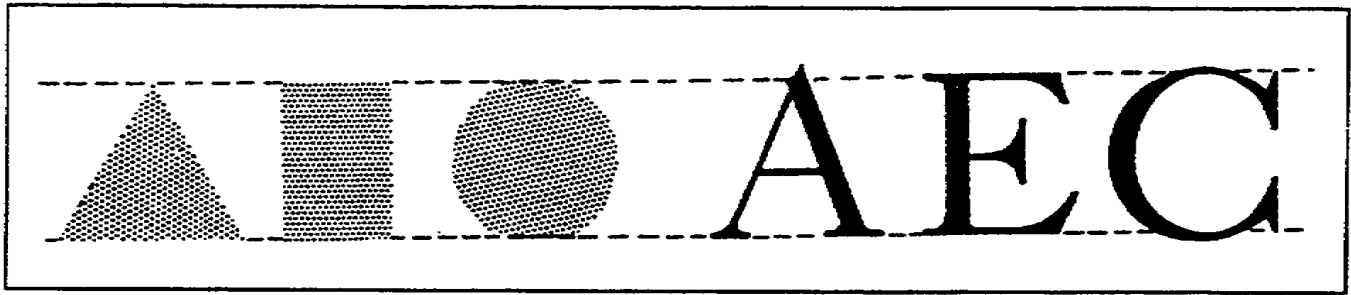


Figure 1-16. Optical illusions in lettering

a. Enlarge the letters that have either circular or rectangular shapes by extending the rectangular shapes above the guideline, and extending circular-shaped letters both above and below the guidelines.

b. Use this same principle to adjust the apparent height of lower-case letters.

11. Summary.

This concludes our discussion of lettering principles. In this part of the lesson, you have learned several techniques that will improve your lettering skills. In the next part of this lesson, you will learn the basic strokes necessary to form balanced letters. You will also learn how to use guidelines and grids to form balanced, well-constructed letters.

PART C - USE OF BASIC STROKES WITH GUIDELINES AND A GRID

In the previous part of this lesson, you learned the importance of legibility in lettered work. You also learned some techniques to achieve legibility in your lettering projects. In this part of the lesson, you will learn how to use some tools to achieve consistency and balance in your lettering.

12. Guidelines.

Guidelines are light pencil-ruled lines you place on your work. You then form your letters between these guidelines. The overall appearance of your work will depend largely on how well you measure and construct guidelines. Accurate guidelines help you achieve balanced line spacing and uniform letters, both of which are important elements of legibility. To construct accurate guidelines, you will need a printer's rule or another device that is graduated in points and picas, a sharp soft lead pencil, and a set of dividers. There are four guidelines, each has a name, each has a purpose, and a defined relationship exists both between and among them. Refer to figure 1-17.

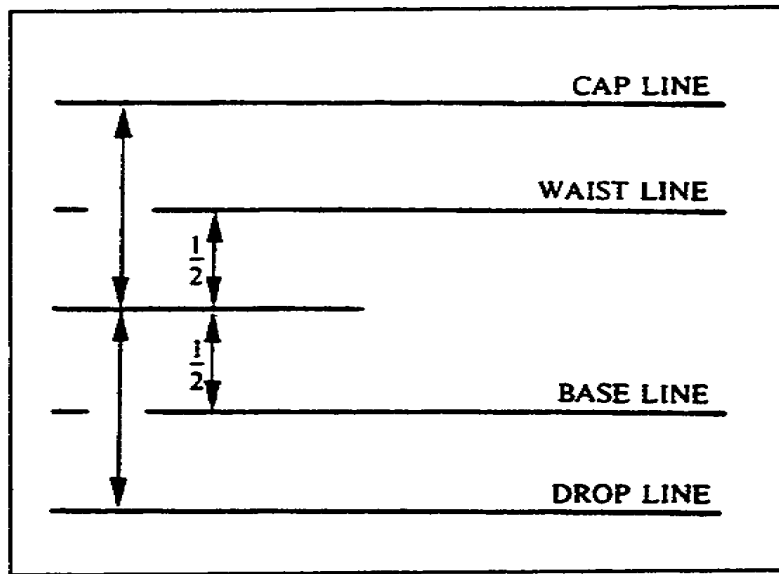


Figure 1-17. Guidelines

a. Cap Line. This is the line that defines the top of capital letters and the top of ascenders of small letters. Start the strokes for capital letters and for the ascenders of small letters from this line.

b. Waist Line. Use this line as the top of lower-case letters that do not have ascenders or to begin the swell of lower-case letters that do not have ascenders.

c. Base Line. The base line is the bottom guideline for the swell of lower-case letters. It is also the bottom line for upper-case letters.

d. Drop Line. This is the line that serves as the guideline for the bottom of lower-case letters that have descenders.

NOTE: We explain the terms ascender, descender, and swell later in this part of the lesson.

13. Guideline Spacing.

You determine the spacing between guidelines by the size of the letters you use. Regardless of the size of the letters, the spacing between the lines must always have the same relationships. The spacing between the cap line and the waist line should be approximately one half ($\frac{1}{2}$) that of the spacing between the waist line and the base line. Use these guidelines to assist you in achieving balance and stability in projects you letter.

14. Calculating Guideline Spacing.

If your capital letters are to be 36 points high, then make the distance between the cap line and the base line 36 points (1/2 inch). If the line you are to letter includes lower-case letters, you also need to draw the waist line and the drop line. Make the distance between the waist line and the cap line approximately 1/2 the distance between the cap and base line, in this example 18 points or 1/4 inch. This is also the correct distance between the base line and the drop line. Maintain these ratios between guidelines regardless of the size of the letters you draw. Use dividers and a printer's rule to ensure accurate measurement of the distances between guidelines.

15. Grids.

Grids are another useful tool you use to achieve balance and stability in projects you letter. Graph paper is one example of grids. You can also construct your own using dividers and a printer's rule. Additionally, you can use grids and guidelines in a combination. Refer to figures 1-18 through 1-21 for examples of how to use grids and guidelines.

NOTE: The arrows and numbers shown on figures 1-18 through 1-21 represent the order in which you make your strokes to construct letters.

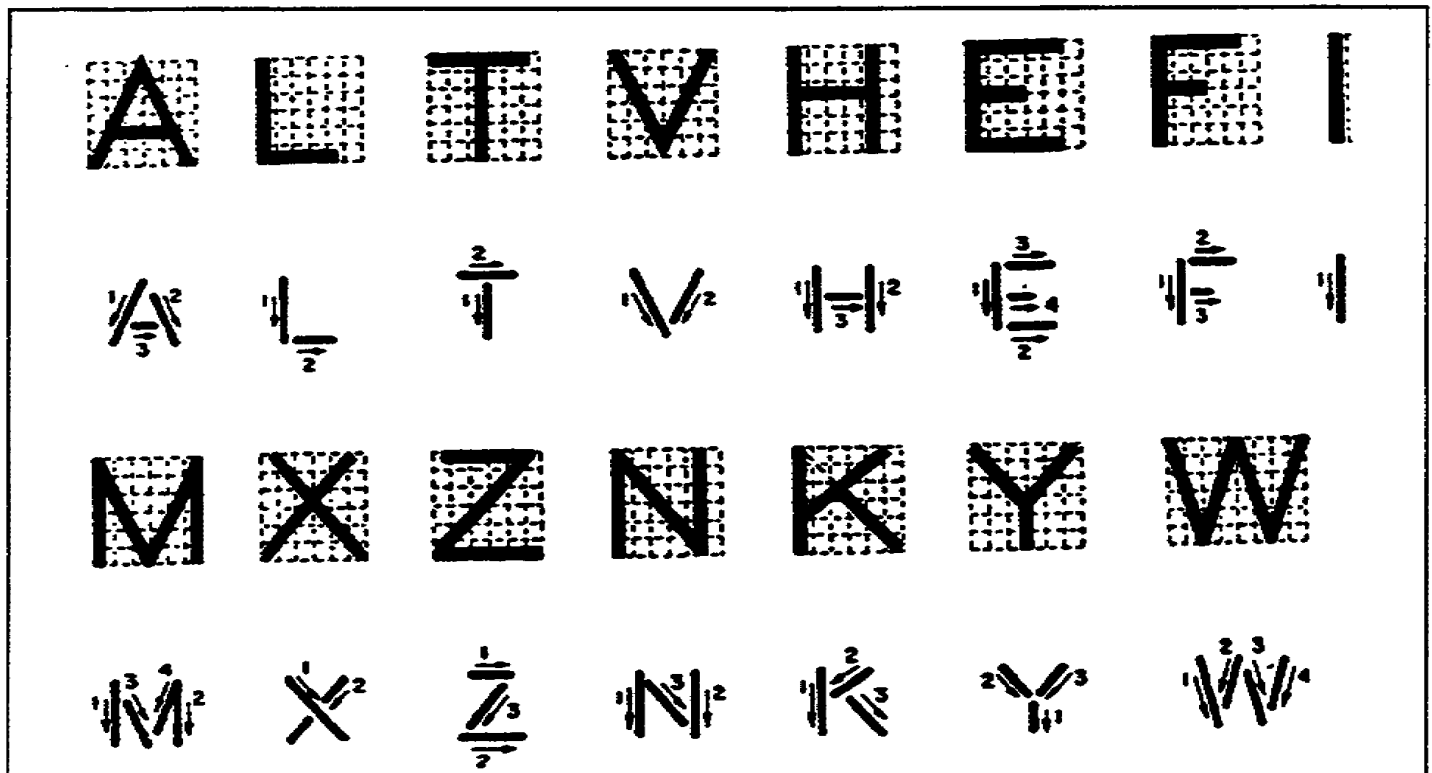


Figure 1-18. Vertical and horizontal strokes

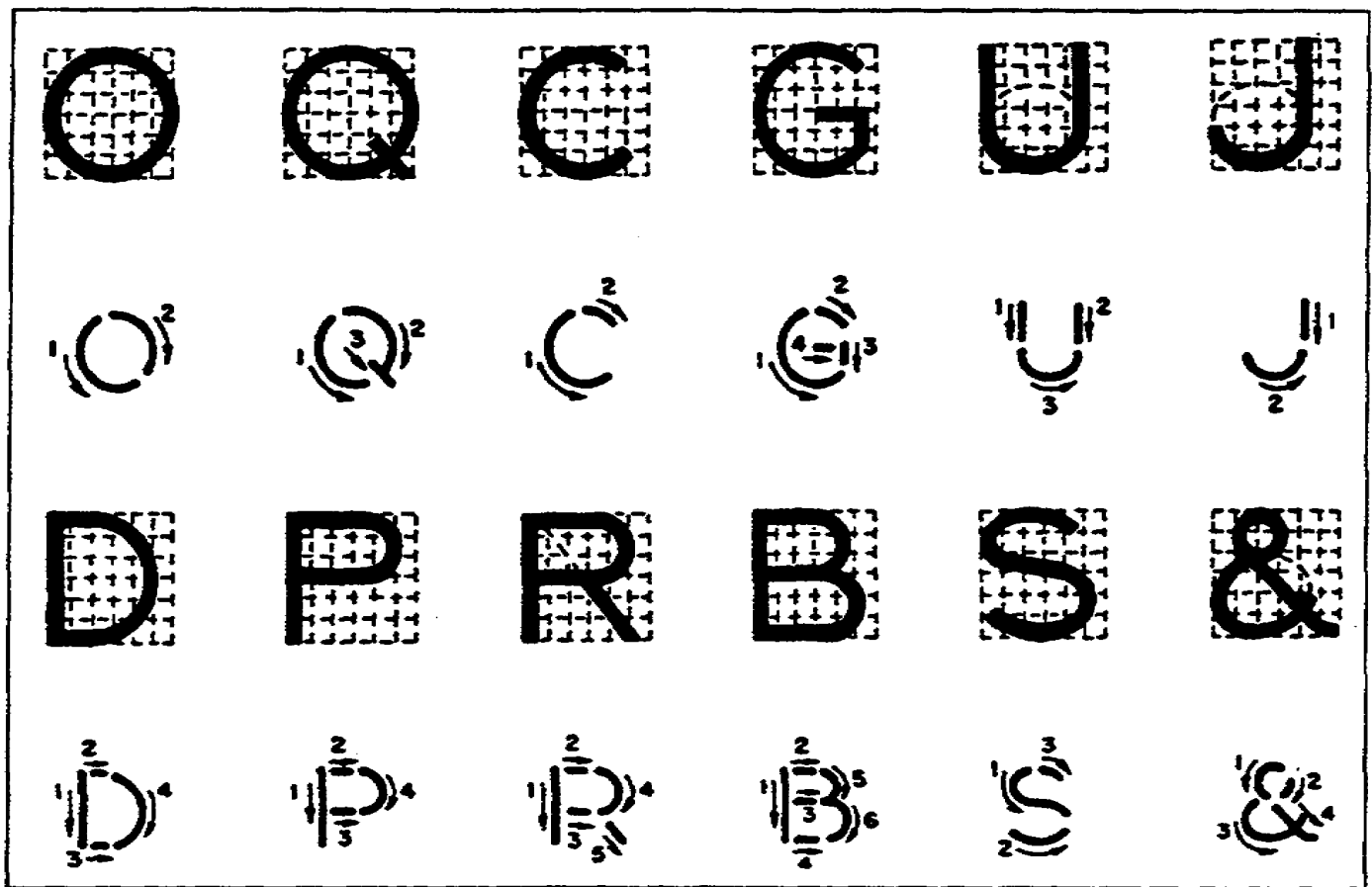


Figure 1-19. Vertical, horizontal, curved, and combination strokes

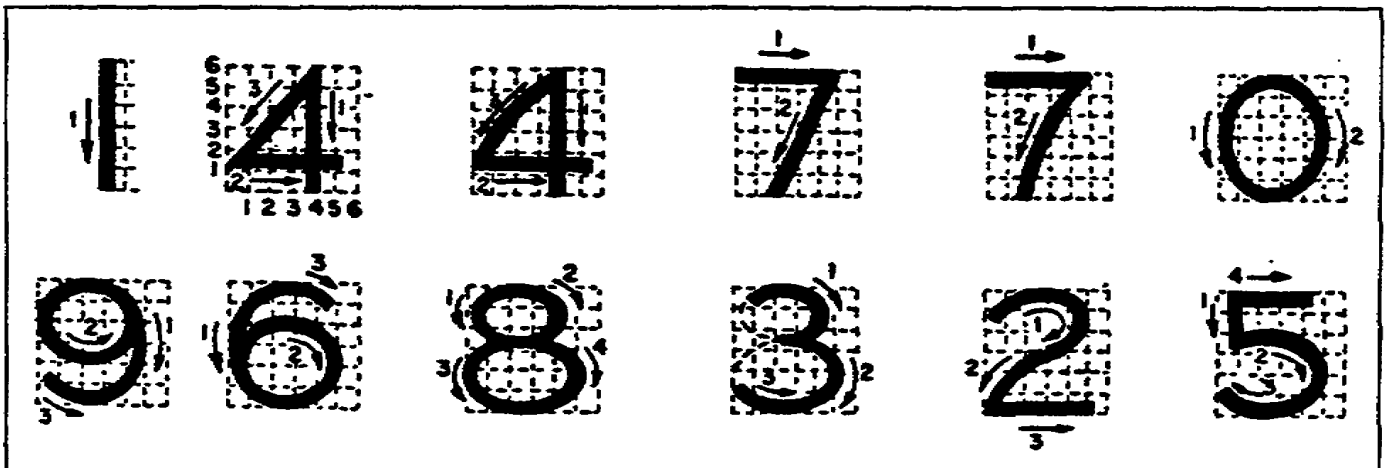


Figure 1-20. Gothic numerals

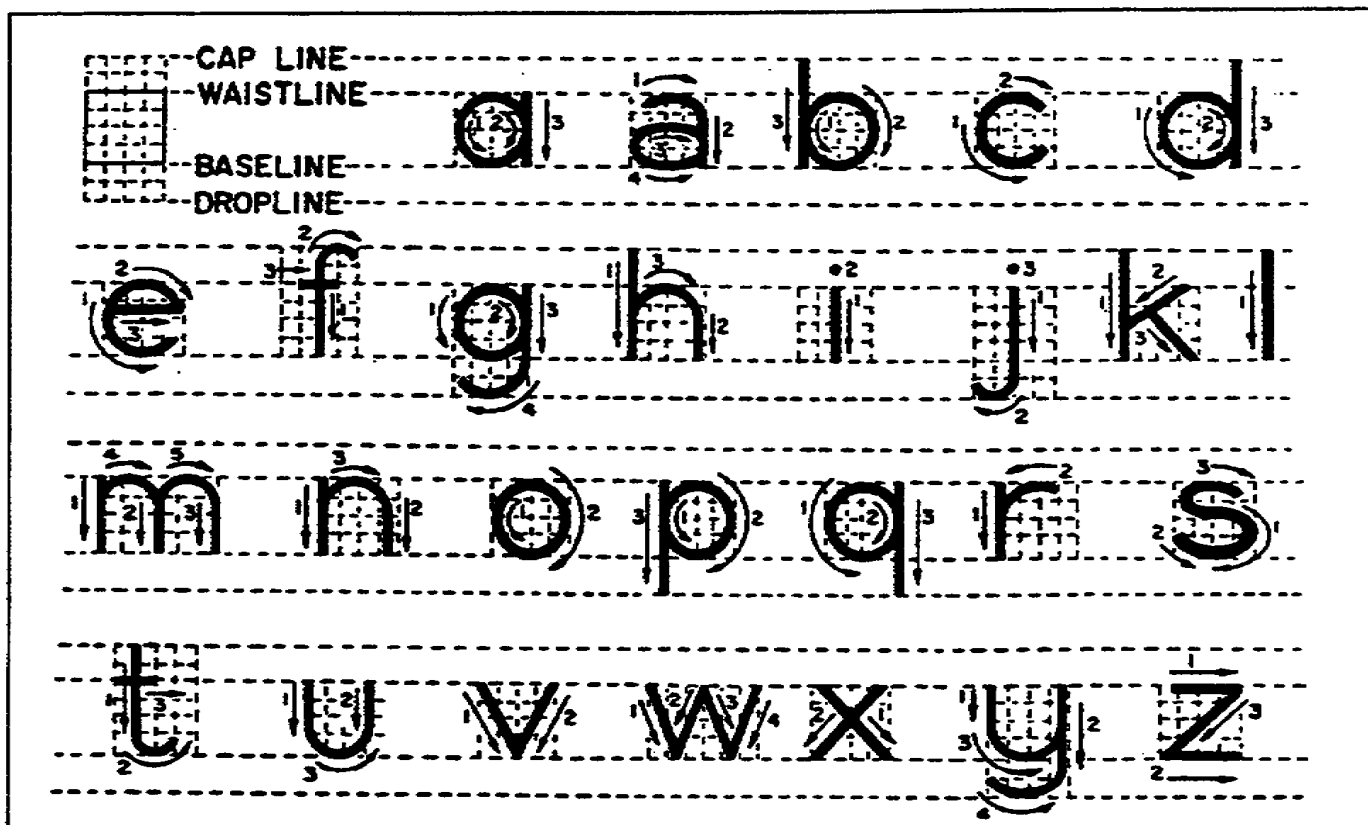


Figure 1-21. Lower-case letters

16. Grids and Italic Letters.

Grids are also useful as a tool to achieve balance and uniformity when you construct italic letters. Refer to figures 1-22 and 1-23. To construct italic letters, make the stems of italic letters at a $67\frac{1}{2}$ degree angle measured counterclockwise from the horizontal. Make the major angle of curved letters at a 45 degree angle measured counterclockwise from the horizontal. All the other techniques you have learned in this subcourse for spacing apply to italic letters as well as those you learned in this paragraph.

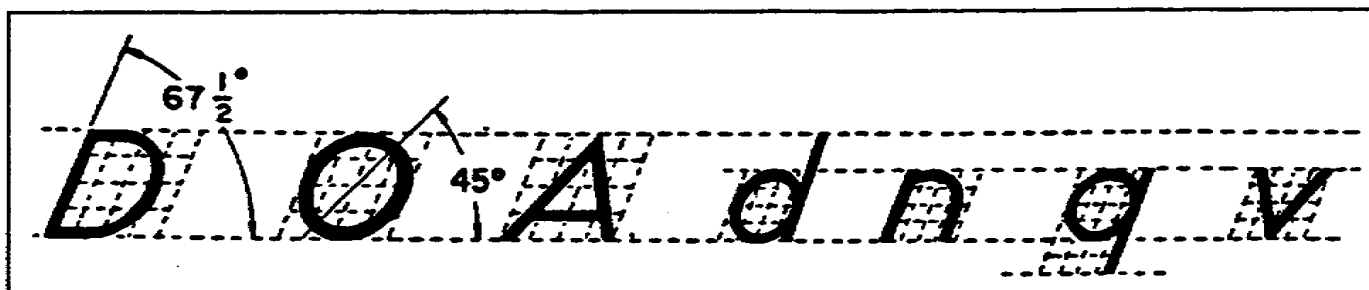


Figure 1-22. Italic letters

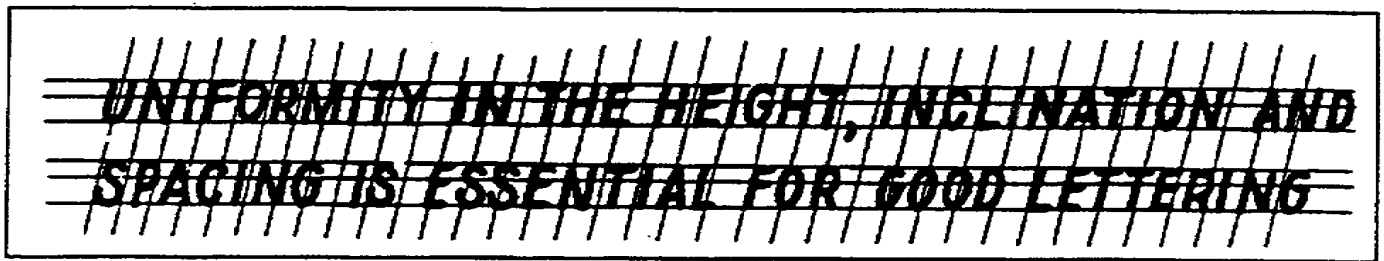


Figure 1-23. Balance and uniformity

17. Fundamental Lettering Strokes.

Figures 1-24 and 1-25 include arrows and numbers that indicate the direction and order of the strokes used to construct letters. Notice that there are only six basic strokes you must learn in order to construct the entire alphabet and numbers. Figure 1-24 depicts these six basic strokes. There is only one way to learn how to construct these basic strokes--practice! Appendix B of this subcourse contains some guidelines and grids to assist you in learning these strokes. After you have completed reading through this subcourse, use the grids and guidelines in appendix B and practice the basic strokes. Ask your supervisor to review and comment on your skills or compare your results with figure 1-24. Appendix B also includes guidelines for you to follow when you practice these strokes in various combinations to form letters. Once you have practiced the basic strokes and are satisfied with your results, practice forming the letters. If you have little experience drawing letters, use a carpenter's pencil sharpened to a chisel point. You will learn more about pencils and other hand lettering tools in lesson 2 of this subcourse.

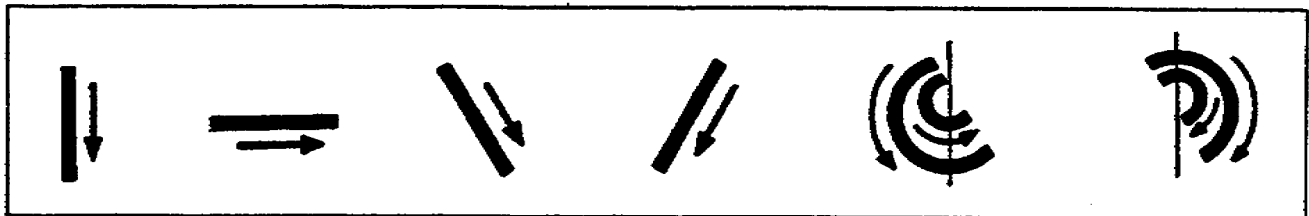


Figure 1-24. Fundamental lettering strokes

18. Letter Nomenclature.

To communicate instructions about letters, you must know the names of the various parts of letters. Using the correct names provides a common language to both give and receive instructions regarding letters. For example, if your supervisor states that you need more practice drawing swashes, you need to know what he

is talking about. Refer to figure 1-25 and read through the following definitions.

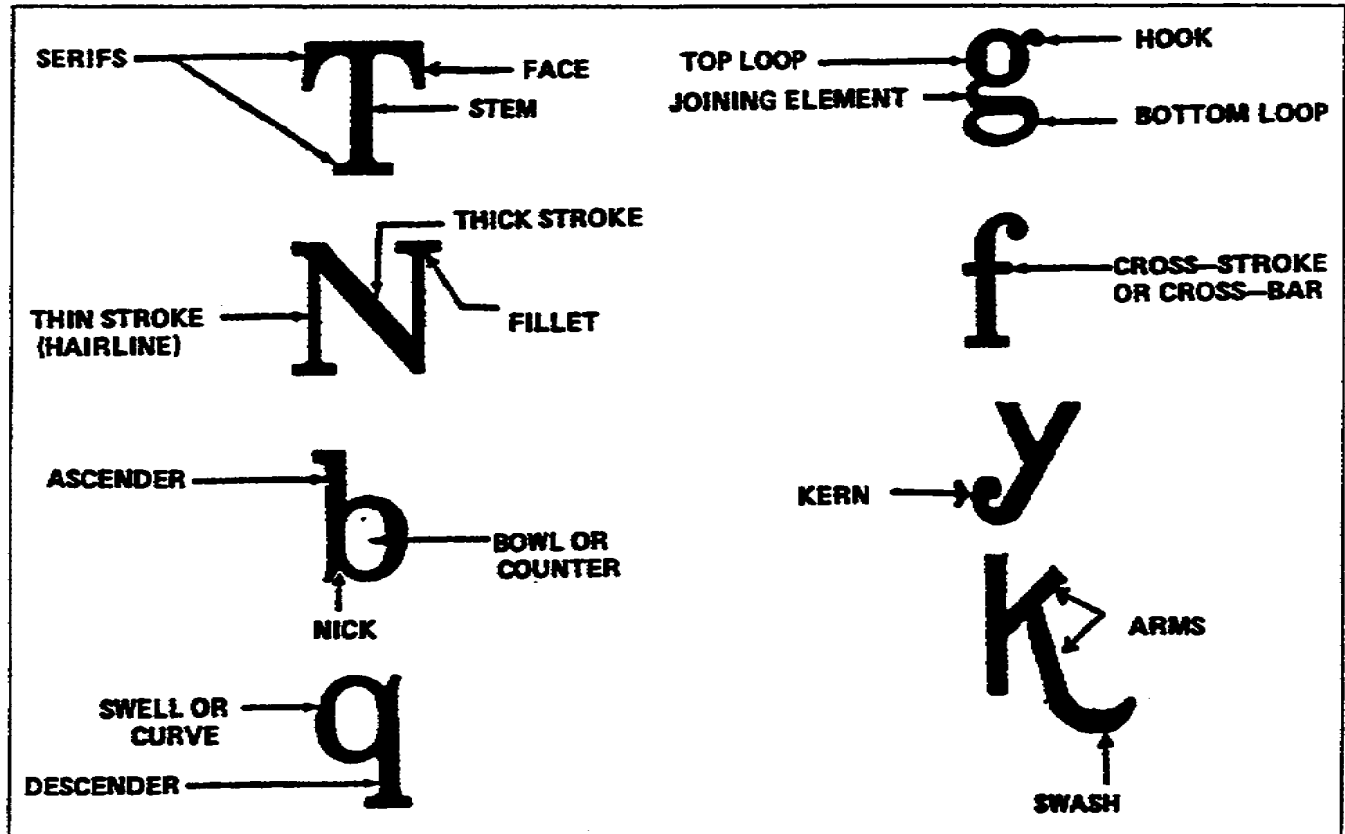


Figure 1-25. Letter nomenclature

a. Serifs. Serifs are thin, short finishing strokes at the top and bottom of letters. Serifs are typically part of Roman letters.

b. Stem. The stem of a letter is the straight, vertical line that forms the basis for most letters of the alphabet.

c. Fillet. A fillet is a thick downward stroke usually made with a broad nibbed pen with the nib held parallel to the line of lettering.

d. Hairline. A hairline is a thin stroke either horizontal or vertical. You can produce a hairline with a thin nibbed pen. You can also produce one by holding a broad nibbed pen parallel to the line of work and moving it horizontally.

e. Ascender. The ascender is the stem of lower-case letters that extend above the body of the letter.

f. Descender. The descender is that portion of lower-case letters that extends below the body.

g. Bowl. The bowl (also referred to as the counter) is the white space inside the curved portions of letters.

h. Swell. The swell (also referred to as the curve) is the curved portion of letters. Make the swell slightly wider than the stem, otherwise it will appear thinner.

i. Cross Bar. The cross bar (also referred to as the cross stroke) is the thin cross stroke you make on lower-case letters f and t, and the horizontal stroke of some upper-case letters such as T and E.

j. Miscellaneous. Kerns and swashes are embellishments to letters. You will find the definitions of these terms in paragraphs 2d and 2g of this lesson. The other terms shown on figure 1-25 are self explanatory.

19. Summary.

This concludes lesson 1. Complete the practice exercise on the following pages, then proceed to lesson 2.

LESSON 1

PRACTICE EXERCISE

The following items will test your grasp of the material covered in this lesson. There is only one correct answer for each item. When you complete the exercise, check your answer with the answer key that follows. If you answer any item incorrectly, study again that part of the lesson which contains the portion involved.

1. You have been tasked to letter a project. Your supervisor tells you to use a lettering style that imitates old-fashioned handwriting. Given this information, which of the following should you use to letter the project?
 - A. Roman
 - B. Script
 - C. Gothic
 - D. Cursive
2. You have been tasked to add prominence to a certain portion of a lettering project by using letters that are wide compared to their height. Your supervisor asks you to recommend a method of accomplishing this. Which of the following should you recommend?
 - A. Use bold letters
 - B. Use swash letters
 - C. Use extended letters
 - D. Use condensed letters
3. You are reviewing a lettering project and the line spacing appears to be imbalanced. Using a printer's rule you measure both the letter height (18 points) and the line spacing which is 36 points. Which of the following ranges of line spacing is appropriate for letters that are 18 points high?
 - A. 9 to 27 points
 - B. 10 to 20 points
 - C. 15 to 21 points
 - D. Equal to the height of the letter (18 points)

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4. Every specialty in the Army has a vocabulary of terms peculiar to it. Illustrators are no exception. The various parts of letters each have a name and you must be familiar with them. Which of the following terms do you use to describe the white space inside the curved part of letters?
- A. Kern
 - B. Bowl
 - C. Swell
 - D. Swash

LESSON 1

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

<u>Item</u>	<u>Correct Answer and Feedback</u>
1.	B. Script Remember that script has kerns. Kerns make the letters flow together much as the letters do when you write. Therefore, of the choices offered, script most resembles handwriting (page 1-5, para 2d).
2.	C. Use extended letters Extended letters are wider than they are high and they tend to stand out from other types of letters (page 1-9, para 4b).
3.	A. 9 to 27 points The appropriate line spacing is between $1/2$ and $1 \frac{1}{2}$ the size of the letters. In this case, the letters are 18 points high (one half of 18 is 9, one and one half of 18 is 27). Remember, there are no hard and fast rules for line spacing, use your best judgement (page 1-12, para 8a).
4.	B. Bowl The terms associated with letters are not all self-explanatory. However, as an illustrator you must become familiar with the correct terms associated with letters. If you missed this item, you should review the section on letter nomenclature (page 1-22, para 18g).

LESSON 2

FREEHAND LETTERING TOOLS AND THEIR USES

Critical Task: 113-579-1037

OVERVIEW

LESSON DESCRIPTION:

In this lesson you will learn the techniques necessary to letter using pencils and pens and learn the types of pencils/pens available. You will also learn the techniques necessary to letter using felt tip markers and brushes and the types available.

TERMINAL LEARNING OBJECTIVE:

- ACTIONS:
- a. Identify the different types of pencils and pens and their uses.
 - b. Describe the techniques necessary for lettering when using pencils and pens.
 - c. Identify the different types of felt tip pens and types of markers available.
 - d. Identify the techniques of lettering using different types of brushes and felt tipped markers.
- CONDITION: You will be given information from NAVEDTRA Illustrator Draftsman Manual 10472.
- STANDARD: You will identify the various types of pens, pencils, felt tip markers, and brushes and their uses in accordance with NAVEDTRA Illustrator Draftsman Manual 10472.
- REFERENCES: The material contained in this lesson was derived from the following publication: NAVEDTRA Illustrator Draftsman Manual 10472.

INTRODUCTION

You freehand letter without mechanical aids using the basics strokes for each letter. Pencils, pens, markers, or brushes are the traditional freehand lettering tools. In this lesson you will learn how to identify the various types of these tools and their appropriate use.

PART A - PENCILS

1. Pencil Identification.

Manufacturers make drawing pencils in a wide variety of graphite densities (relative hardness). For ease of identification, pencil manufacturers stamp or emboss the hardness on the pencil. In general, all drawing pencils are classified as either soft, medium, or hard. The letter "B" denotes a soft, dark graphite; whereas the letter "H" indicates a hard, light graphite. In addition to the letters "B" and "H," pencils are identified with a number that represents its relative hardness compared to other pencils. For example, both 2B and 6B drawing pencils are soft pencils; however, of the two drawing pencils, the 2B is a harder drawing pencil. You will notice though that in the B category, the lower the number the harder the pencil, unlike the H category. Refer to figure 2-1 that illustrates various drawing pencils.

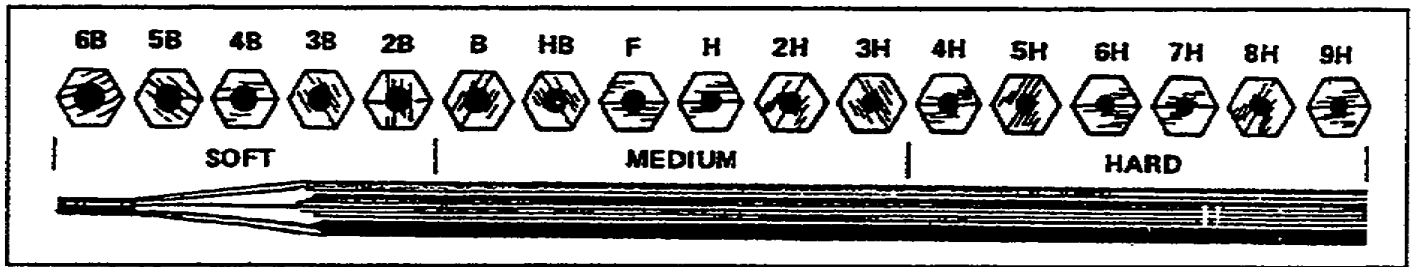


Figure 2-1. Drawing pencils

a. Use the following information as a general guide to select the correct pencil. Use soft leads for illustrative drawings; they work well for shading and toning. Use medium leads for general purpose technical drafting, tracing, and lettering. Use hard leads for charts, graphs, or diagrams that require precision.

b. Choosing the correct drawing pencil for a lettering project also depends on the roughness of the paper. The rougher the paper, the harder the pencil lead must be to produce quality lettering. You must choose a pencil hard enough to prevent excessive wear of the point, but soft enough to produce jet-black lettering. As an aid to selecting the proper pencil, try several different pencils until you find the one that best suits the needs of the project and paper.

c. The size of the lettering you construct for a project also affects the drawing pencil to use. When drawing small letters, use a drawing pencil sharpened to either a conical or chisel point. If you are constructing medium-sized letters,

then use a thick, soft lead drawing pencil, sharpened to a chisel point.

2. Lettering With Pencils.

In order to use any tool effectively, you must learn to use it correctly. There are no hard and fast rules for using a pencil, but there are some guidelines that will improve your ability to use pencils. Figures 2-2 and 2-3 illustrate one good method for holding a pencil.

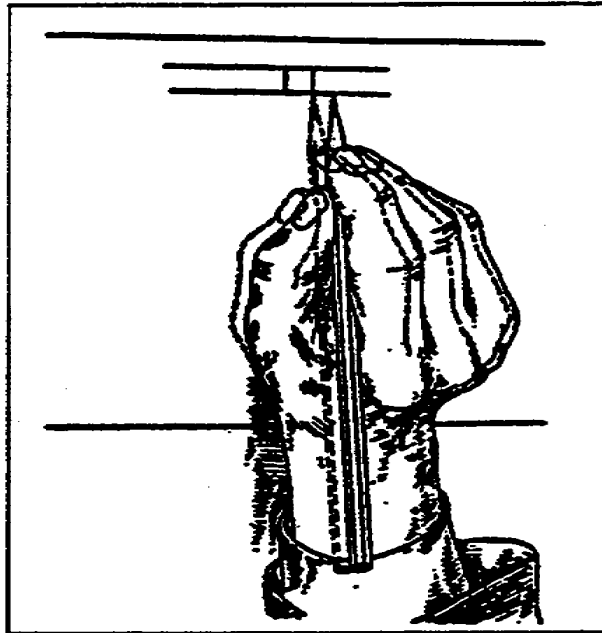


Figure 2-2. Horizontal strokes

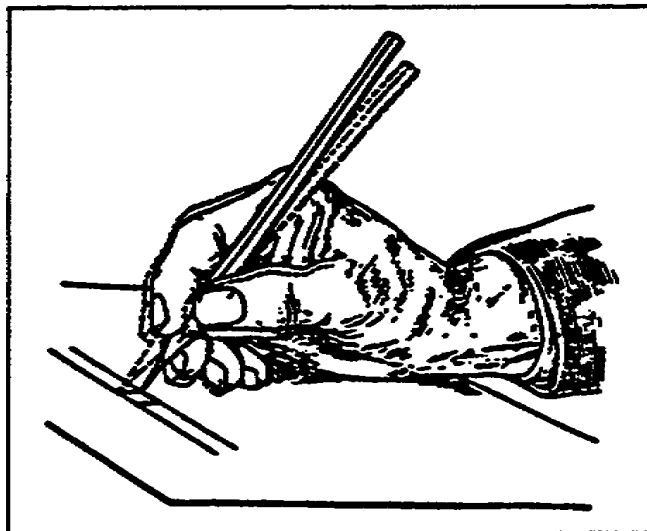


Figure 2-3. Vertical strokes

a. Hold the pencil with the thumb, forefinger, and second finger in your normal writing position.

b. Use only enough pressure to hold the pencil. If you grip the pencil too hard, you will lock up your forearm muscles and you cannot produce fluent, graceful strokes.

c. Draw vertical, slanting, and curved strokes with a steady even movement with a slight pivoting at the wrist.

d. Avoid exerting too much pressure on the point. Excessive pressure may dull or break the point or perhaps cut grooves on the surface of your work.

e. The ideal pencil, for a given project, is one that does not smudge (too soft), and does not leave unwanted marks (too hard) on your work.

3. Making Your Point.

In order for your work to demonstrate your professionalism, you must maintain the point on your pencil. In general, a high quality pencil sharpener will perform its task properly. However, you may need a chisel point on a carpenter's pencil or other drawing pencil, to make the broad flat strokes and thin lines necessary to construct both Gothic and Roman letters (figure 2-4). Use the following steps to make a chisel point.

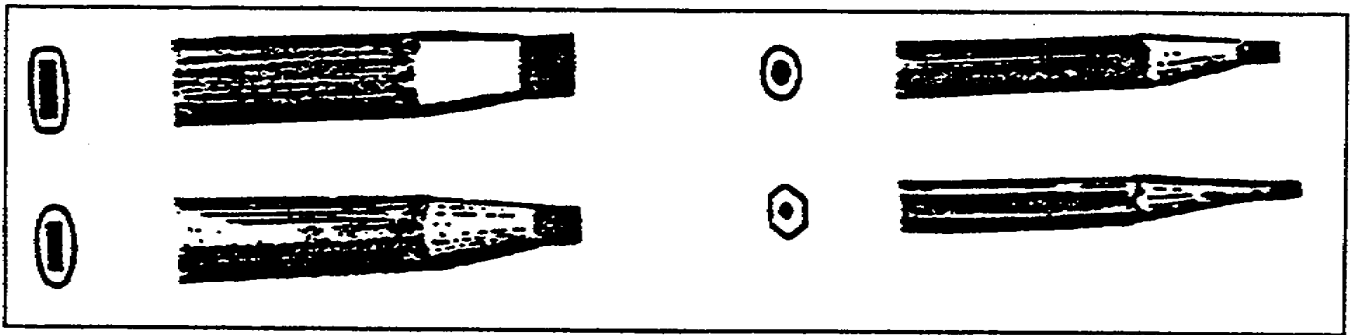


Figure 2-4. Front and side views of chisel points

a. Use a sharp single-edged razor blade and cut away enough of the topside and underside wood to expose about 1/4 inch of lead. Exposing too much makes the point fragile and subject to breaking. Exposing too little causes the point to wear away quickly.

b. Shave the lead and make it flat on the top and bottom. Do not exert too much pressure or the lead will break. Make the sides of the lead parallel.

c. Rest the pencil on a table or other firm surface, then cut off the tip using a sharp single-edged razor blade held at a right angle to the pencil. Exert a firm steady pressure until the tip snaps off.

d. After you satisfactorily complete steps a through c, the lead will have the correct shape, but it will be rough. To smooth the tip, hold the pencil at a right angle to the paper and make several strokes. This will remove any burrs from the tip.

e. An alternative to the process described in the preceding paragraph is to use sand paper to shape the lead. Use this process if you do not have a sharp single-edged razor blade. Never use a dull razor blade as it may slip and cut you.

4. Summary.

This completes our discussion of the pencil as a lettering tool. In the next part of this lesson, you will learn similar information about the lettering pen.

PART B - TECHNIQUES OF LETTERING USING DIFFERENT TYPES OF PENS

5. Introduction to Lettering Pens.

Before the invention of the printing press, authors hand lettered all books and other documents using a broad, flat pen.

a. Freehand lettering with a technical fountain pen, standard fountain pen, speedball lettering pen, or a flexible quill with ink is still a valid and useful technique to letter posters, signs, charts, and displays. There are a wide variety of inks presently available. They range from a high pigment, opaque India ink to a low pigment writing ink and are available in an assortment of colors. There are multiple pens suitable for lettering the projects assigned to you. Just as with the pencil, you must know how to select the proper pen for your task and how to use it correctly.

b. In this part of the subcourse, you will learn the features of technical fountain pens, speedball pens, and text writing pens. These are the most common and the ones you will most likely use.

(1) Technical fountain pens. Several manufacturers produce these pens and their greatest advantage is that they have a reservoir that holds ink. Figure 2-5 shows a cutaway drawing of a technical fountain pen.

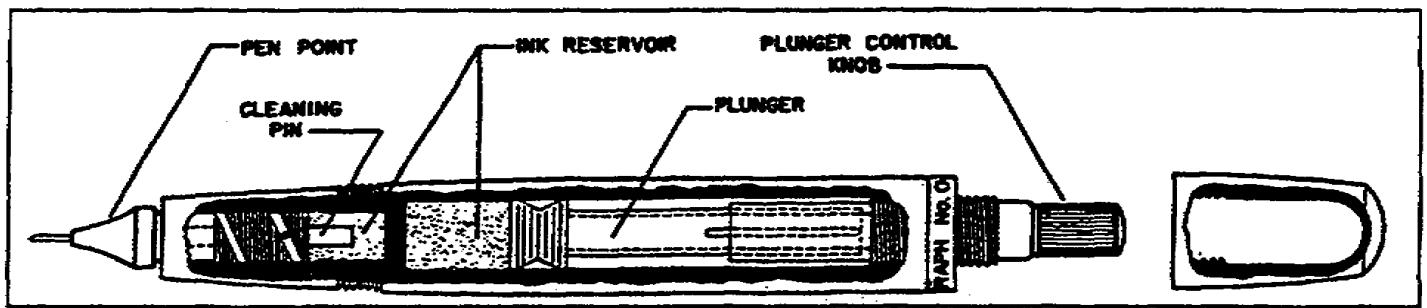


Figure 2-5. Typical technical fountain pen

(a) The particular pen shown in figure 2-5 has a plunger control knob. Turn the knob counterclockwise to drain the reservoir, turn it clockwise to fill it. Always follow the manufacturer's instructions to maintain this type of pen, pay particular attention to the point. These pens are expensive. As with other tools, proper maintenance will extend their useful life.

(b) Most pens of this type include a cleaning pin, designed to keep the ink flowing evenly from the reservoir to the point. After you fill the pen, wipe the point, then shake the pen lightly. Shake the pen periodically during use, to promote smooth operation.

(c) Hold the pen perpendicular to the paper at all times. This is necessary to keep the point from wearing at the edges. The design of this pen is such that you cannot perform the precise tasks with a worn point.

(2) Speedball pens. Speedball pens have four different point or nib styles, each designated by a number and a letter, that produce different sizes and styles of lines.

(a) The number designation ranges from 0 to 6. It indicates the size (width) of the point. The smaller the number, the wider the line. For example, a point designated by a 3 creates a wider line than a point designated by a 6.

(b) The letter indicates the style of the point, described as follows:

- The "A" (square) style speedball pen point has a flat, square tip that creates a line of uniform width with square edges. Use the "A" point for square Gothic and block lettering.
- The "B" (round) style point has a round tip that produces uniform lines with round edges. Use the "B" nib for Gothic lettering and uniform lines.

- The "C" (oblong) style point has a chisel-shaped point that produces thick and thin strokes. Because the "C" nib produces thick and thin strokes, it is useful for lettering projects that require Roman and old English letters.
- The "D" (oval) style point has an oval-shaped point that produces thick and medium lines. Use it to letter projects that require either bold Roman or italic faces.

(c) Speedball pens are equipped with a brass clip on the underside of the point (nib) that serves as a small reservoir or well for the ink. The four styles of speedball pen points as well as the line styles and widths are shown in figure 2-6.

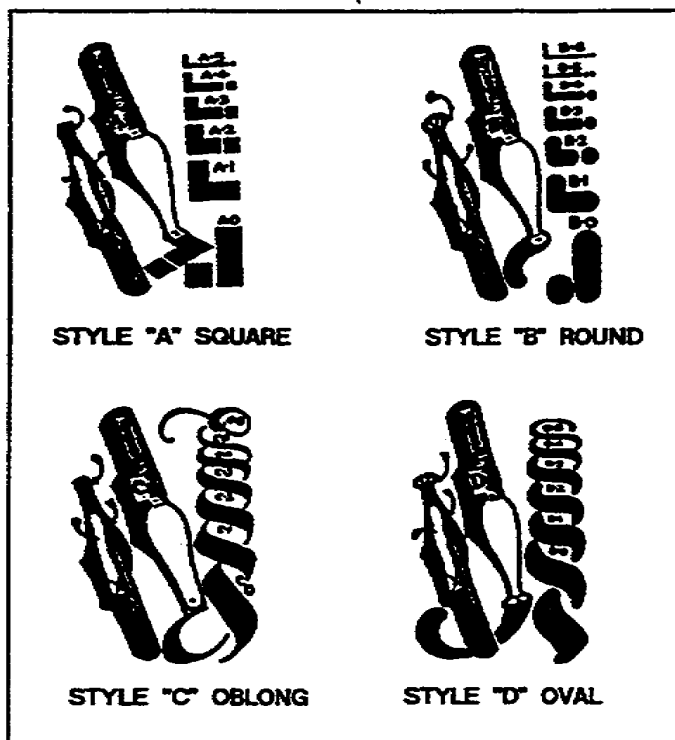


Figure 2-6. Speedball pens

(d) Use the quill attached to the stopper of the ink bottle to fill the well. Keep the pen point clean. Wipe it with a lint-free cloth after filling it. Always clean it thoroughly after use and prior to storage.

(3) Text writing pens. These pens have neither a reservoir nor a well. They resemble the type C speedball pen. However, they are made of thinner metal and produce a much sharper line than the speedball pen. Figure 2-7 displays the text writing pen.

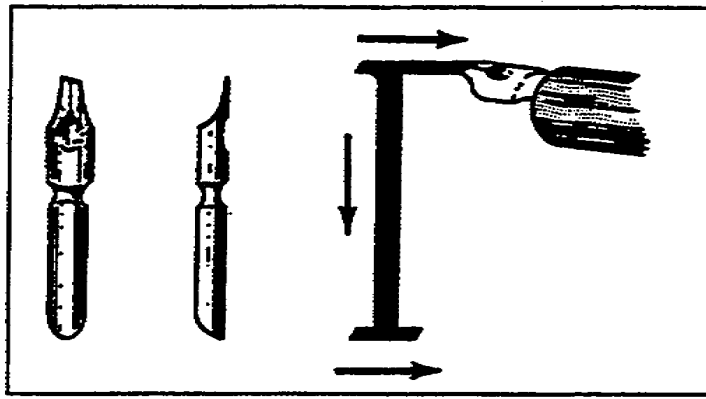


Figure 2-7. Text writing pen

(a) Notice that the nibs of text writing pens are slanted so that they touch the paper uniformly when the pen is held in a normal comfortable position.

(b) Hold this and other pens with the same firm, yet relaxed grip you use to hold a drawing pencil.

6. Proper Use of Pens.

a. How to Hold the Pen. When using a pen to apply lettering, hold the pen as you would a drawing pencil. Do not hold the pen tightly because you lose the sense of feel required to construct letters correctly. Always pull the pen in the direction it is leaning when you are holding it. If you try to push the pen, the tip digs into the paper and splatters ink over the project.

(1) Once you have selected the style and the type of pen to use, lightly draw the guidelines and letters. When you have the guidelines and lettering in place, rearrange the drawing surface to a comfortable position that provides a constant point of view (perspective).

(2) Positioning the work surface at a 60-degree angle to the horizontal (as shown in figure 2-8) provides a comfortable working angle and a constant point of view. It also helps you to produce uniform lettering.

b. Using and Caring for Pens. If the pen does not have a reservoir, apply ink by dipping the tip of the pen into the ink bottle. Remove any excess ink from the tip by touching it to the side of the bottleneck. Each time you re-ink the pen and before you apply ink to the project, make two or three trial strokes on a piece of scrap paper. This ensures the tip has the correct amount of ink in the nib. The trial strokes also allow

you to check the quality of the lines and to ensure no foreign matter is lodged in the tip.

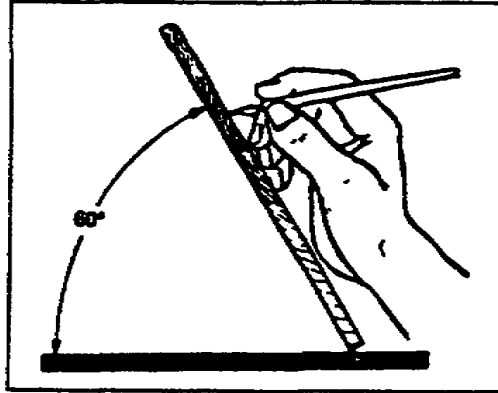


Figure 2-8. Work position for using pens

c. Cleaning the Pen. Do not allow any foreign matter to collect in the nib. Clean the nib as often as necessary. When you have completed lettering the project, thoroughly clean the pen with pen cleaner and pat the nib dry with a lint-free cloth.

d. Correcting Mistakes. Even the best illustrators make mistakes. If you make a mistake while using ink, correct the error by lightly scraping the mistake with a steel eraser. Then reburnish and re-ink the surface, or cover the error with whiteout and re-ink the surface.

7. Summary.

This concludes the discussion of pens as a lettering tool. Next you will learn to identify and use markers and brushes to letter.

PART C - TECHNIQUES OF LETTERING USING DIFFERENT TYPES OF BRUSHES AND FELT TIP MARKERS

8. Brush Lettering.

This is another lettering tool that requires practice to obtain and maintain proficiency. Use brushes to produce letters ranging from 1/4-inch to 10 feet or more in size. All brushes have three major components: (1) hairs, (2) ferrule, and (3) a handle. There are three different-shaped brushes you use to letter: (1) round, (2) bright, and (3) flat (figure 2-9).

a. Round Brush (brushes A and B). The hairs of the round brush come to either a sharp point (brush A) or a blunt point (brush B). The shape and the pressure exerted on the brush while applying paint determines the type of lettering for which

you may use the brush. To use this brush to produce Gothic lettering, it must have a blunt, round point (brush B) and you must apply even pressure while lettering. If the round brush has a sharp tip (brush A) and you vary the pressure, you can create cursive lettering.

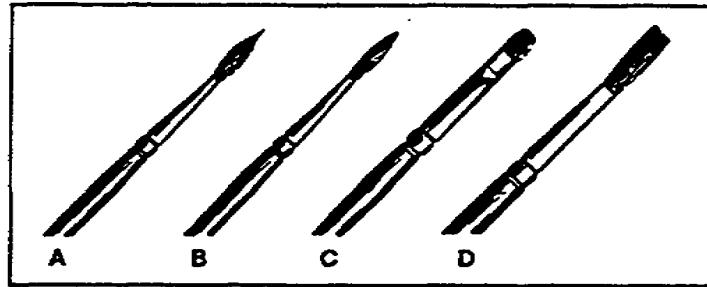


Figure 2-9. Lettering brushes

When using the round brush to produce lettering, you can control the size of the line by controlling the amount of pressure applied on the brush. The more pressure you apply, the wider or broader the lines; conversely, the less pressure you apply, the thinner the lines. A high quality round brush presents a fullness of the hairs when wet, whereas a poor quality brush looks concave at the sides and ragged.

b. Bright Brush (brush C). This brush has hairs that are $1\frac{1}{2}$ times longer than their width and are flat with sharp corners. Use this type of brush to letter show cards, posters, and small signs.

c. Flat Brush (brush D). This brush has hairs $2\frac{1}{2}$ times longer than their width, square corners, and a flat ferrule. The long hairs of this brush allow for smoother application of the paint when making curves and long strokes. This brush also holds more paint than a bright brush; therefore, you can cover more area before resupplying the brush with paint.

9. Brush Quality and Shape.

The finest bristles for brushes are red sable. This is the hair from the tail of the Siberian mink, also called the Red Tartar Martin. No other hair or man-made fiber has the springiness or durability of this hair. It is delicately tapered, the tip is slender and comes to a fine point. It is thicker in the middle (the belly) and tapers again toward the root. The best brushes are shaped like brush B in figure 2-9. Brushes shaped like brush A in figure 2-9 are inferior.

a. There are several other types of brush hair that are suitable for lettering, most are known as "camel's hair." In

fact, these brushes are made from just about every other animal but the camel. Of this type, the best is made from the hair of the common squirrel tail.

b. A low quality red sable brush is preferable to the best "camel's hair" brush.

10. Caring for Your Brushes.

For lettering brushes to perform properly and have a long life, you must clean and store them properly. All paints are not compatible with all thinners. Therefore, when you clean lettering brushes, ensure the thinner is compatible with the paint. Figure 2-10 provides a cross-reference between paints and thinners. If you use an incorrect thinner to clean the brush, you could ruin the lettering brush.

	WATER	TURPENTINE	MINERAL SPIRITS	LACQUER THINNER
WATER COLORS	✓			
LATEX	✓			
LATEX ENAMEL	✓			
ENAMEL		✓	✓	
LACQUER		2	2	1

Figure 2-10. Paint/thinner compatibility chart

a. Proper cleaning and storage of lettering brushes prolongs their life. After you have cleaned the lettering brushes used in oil paints or lacquers, fill them with linseed oil, shape the hairs, and place them on their sides. Never rest brushes on their hairs.

b. An expedient way of storing a brush is to fill the hairs with motor oil. The oil prevents any remaining paint from hardening. Hardening causes brushes to become useless. You must clean the brush and change the oil after a month of nonuse.

c. A paint brush conditioner helps keep the larger brushes soft and pliable.

11. Using Brushes to Letter.

a. Introduction. To construct letters with a brush, choose a brush with hairs equal to the size of the lettering (width of the stroke). After filling the brush with paint, use a scrap piece to work the tip of the brush into a chisel point that is the same size as the normal spread of the brush hairs. Then, form each stroke of the letter with the tip of the brush and maintain equal pressure with each stroke. Excessive pressure causes uneven strokes and shortens the life of the brush.

b. Gripping the Brush. There are two different ways to grip the brush for lettering: pencil and two-finger. The pencil grip is the same grip you use to hold a drawing pencil. Use whichever grip with which you feel most comfortable. No matter which grip you use, you must position the brush at a right angle (perpendicular) to the drawing surface so you finish each stroke with a clean-cut edge.

(1) Most illustrators prefer the two-finger grip (figure 2-11) because it provides more maneuverability of the brush on curved strokes. To use this grip, hold the brush by its ferrule between your thumb and first finger. Keep the brush at a right angle to the drawing surface and rest your other two fingers and the heel of your hand on the drawing surface.

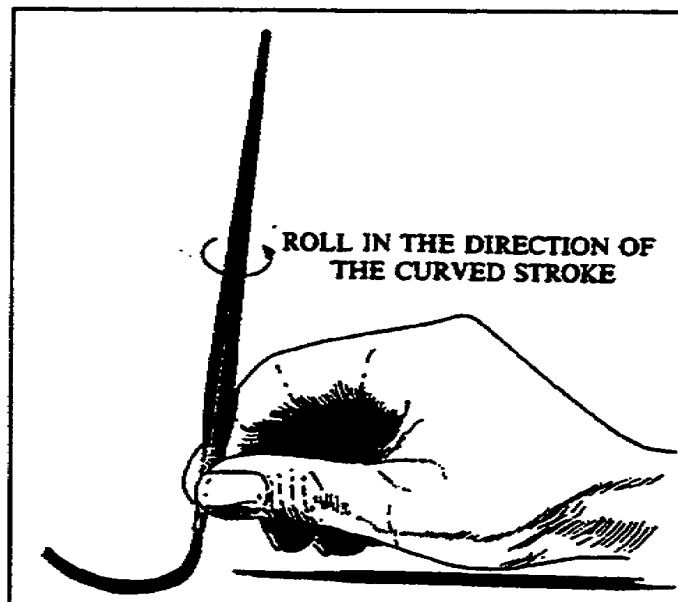


Figure 2-11. Two-finger brush grip

(2) Make each stroke with a coordinated arm, wrist, and finger action. For vertical strokes, pull the brush toward you. To make horizontal strokes, move the brush from left to

right. To draw a curve of uniform width, roll the brush with your fingers in the direction of the stroke.

(3) Figure 2-12 illustrates how to make vertical and curved brush strokes for the letters D and O.

- Step 1. Make a vertical stroke.
- Step 2. Turn the brush sideways and square off the top and bottom of the vertical stroke.
- Step 3. Make the left half of the curve (holding the brush between the thumb and forefinger) twisting the brush in the direction of the stroke.
- Step 4. Connect the curve as required to finish the letter.

To draw the letter O, you start by creating two curves and then turn the brush on its side to complete the letter.

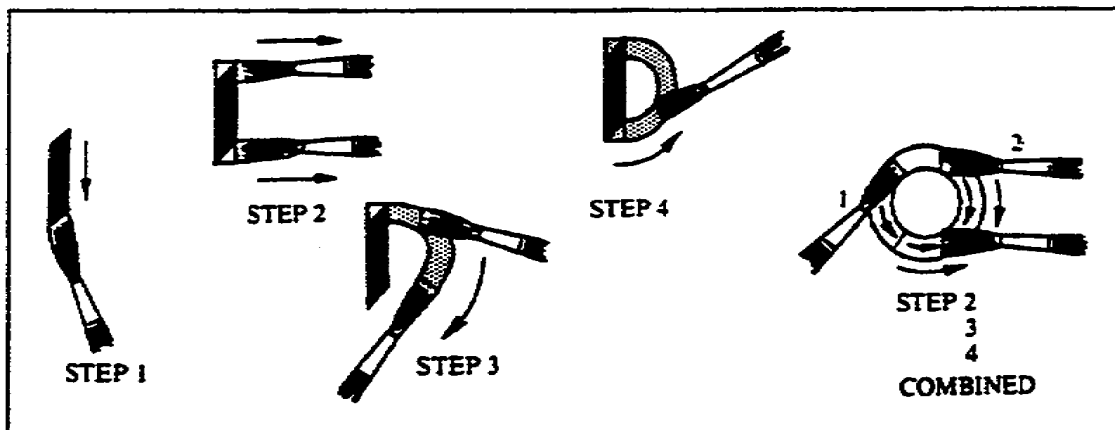


Figure 2-12. Sequence of vertical and curved brush strokes

c. Learning to letter or to perform other tasks with brushes takes significant practice. Always draw guidelines using the techniques you learned in lesson 1. Be careful to apply the proper amount of paint. Refer to figure 2-13 for examples of proper and improper paint consistency.

This concludes our discussion of brushes. As a conclusion to this lesson, you will learn how to use one final lettering tool--markers.

12. Marker Lettering.

An illustrator who can use markers well is an asset to his unit. A marker is a flexible tool with many applications and it is one of the easiest to use.

a. The Felt Tip Marker. The typical felt tip marker has a tip width from $\frac{1}{8}$ to $\frac{1}{4}$ inch across that is cut to a 45-degree angle. It resembles the "C" speedball pen tip. The felt tip marker is very useful to construct flip charts, headings, and titles. Figure 2-14 illustrates three styles of lettering constructed using this tool.

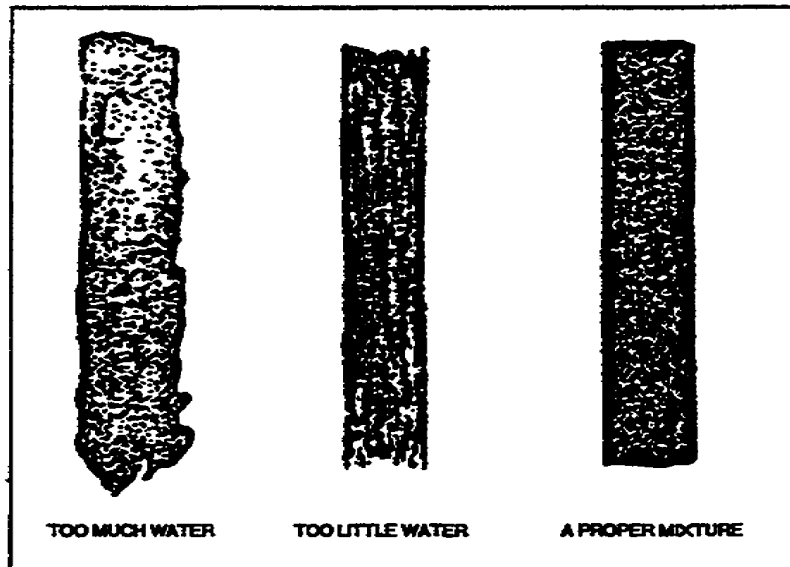


Figure 2-13. Proper paint consistency



Figure 2-14. Felt tip lettering

b. Use of the Felt Tip Marker. Hold the marker using the same grip you use for pencils, at an angle 45-degrees from the horizontal. To construct strokes, use the technique you learned earlier in this lesson for the carpenter's pencil.

13. Summary.

This concludes our discussion of lettering tools and their use. In the next lesson, you will learn some mechanical lettering tools and their use. Complete the practice exercise on the following pages, then proceed to lesson 3.

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LESSON 2

PRACTICE EXERCISE

The following items will test your grasp of the material covered in this lesson. There is only one correct answer for each item. When you complete the exercise, check your answer with the answer key that follows. If you answer any item incorrectly, study again that part of the lesson which contains the portion involved.

1. You are sharpening a carpenter's pencil to a chisel point. How much lead should you expose to prevent breaking the point or excessive wear?
 - A. 1/8 inch
 - B. 1/4 inch
 - C. 3/8 inch
 - D. 1/2 inch
2. You have been tasked to letter a project in Gothic typeface using ink. The only pen available to you is a speedball. You have styles A, B, C, and D in sizes 0 to 6. Your supervisor tells you to use the widest point. Of the following, which should you use?
 - A. A0
 - B. B1
 - C. C2
 - D. D3
3. You have just completed lettering an outdoor sign for the Director of Engineering and Housing using a brush and lacquer paint. Which of the following cleaning solutions is preferable for cleaning this type of paint from your brush before you put it away?
 - A. Water
 - B. Gasoline
 - C. Motor oil
 - D. Mineral spirits
4. You are practicing lettering with a brush. One of the letters is the capital letter 'D'. To create this letter properly, which stroke should you make first?
 - A. Vertical
 - B. Upper horizontal
 - C. Lower horizontal
 - D. Connecting curve

LESSON 2

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

<u>Item</u>	<u>Correct Answer and Feedback</u>
1.	B. 1/4 inch This is not an exact measurement, however, it is a good starting point. This amount has proven to be the best compromise between frequent point breaking and the need to sharpen the pencil often. Also remember, never use a dull razor blade because it might slip and cut you deeply (page 2-4, para 3a).
2.	A. A0 Gothic letters resemble block letters. To make these letters, you need a pen that produces clean square lines. The "A" style speedball pen makes such lines. The size "O" point is the widest size, the smaller the number the wider the line (pages 2-6 and 2-7, para 5b(2)(b) and figure 2-6).
3.	D. Mineral spirits while lacquer thinner is the most preferred cleaning solvent for lacquer paint, it was not a choice for this item. Mineral spirits is also suitable for cleaning lacquer paint from brushes. Always read the label on the paint container and follow the directions. If the label is not readable or is missing, then follow the guidance in figure 2-10 (page 2-11, figure 2-10).
4.	A. Vertical The vertical stroke is the foundation stroke of most letters. If it is not made correctly, you cannot construct the letter properly (page 2-13, para 11b(3) and figure 2-12).

LESSON 3

MECHANICAL, PREPARED, AND COMPUTER-GENERATED LETTERING TECHNIQUES

Critical Task: 113-579-1037

OVERVIEW

LESSON DESCRIPTION:

In this lesson you will learn the use and application of mechanical and prepared lettering techniques, including Leroy and Kroy. You also will learn the use and application of computer-generated lettering techniques.

TERMINAL LEARNING OBJECTIVE:

- ACTIONS:
- a. Describe the use of mechanical and prepared lettering techniques.
 - b. Identify the procedures in mechanical lettering using the Leroy set.
 - c. Describe the use of computer-generated lettering techniques.
- CONDITION: You will be given information from NAVEDTRA Illustrator Draftsman 10472.
- STANDARD: You will identify the use and application of mechanical, prepared, and computer-generated lettering in accordance with NAVEDTRA Illustrator Draftsman 10472.
- REFERENCES: The material contained in this lesson was derived from the following publication: NAVEDTRA 10472.

INTRODUCTION

In lesson 2 you learned the techniques of preparing lettering by hand. In this lesson you will learn how to use a variety of mechanical, prepared, and computer lettering tools.

PART A - USE AND APPLICATION OF MECHANICAL AND PREPARED
LETTERING

1. Advantage of Mechanical and Prepared Lettering.

Compared to hand lettering, both mechanical and prepared letters provide you the advantage of producing uniform letters. There are several methods of producing letters mechanically. In this lesson, you will learn the most common methods. To effectively use these methods, you must develop the necessary skills. As with hand lettering, you must practice using mechanical lettering tools to become proficient.

2. The Leroy Lettering Set.

Because of its popularity, the Leroy lettering set has become the industry standard for mechanical lettering. The basic Leroy lettering set includes 12 templates or guide sizes, each expressed in thousandths of inches. The template sizes are 80, 100, 120, 140, 175, 200, 240, 290, 350, 425, and 500 with the height of the letters indicated in thousandths of an inch. The other components of a Leroy set and their function follows. Refer to figures 3-1 and 3-2 that illustrate the Leroy set and its parts.

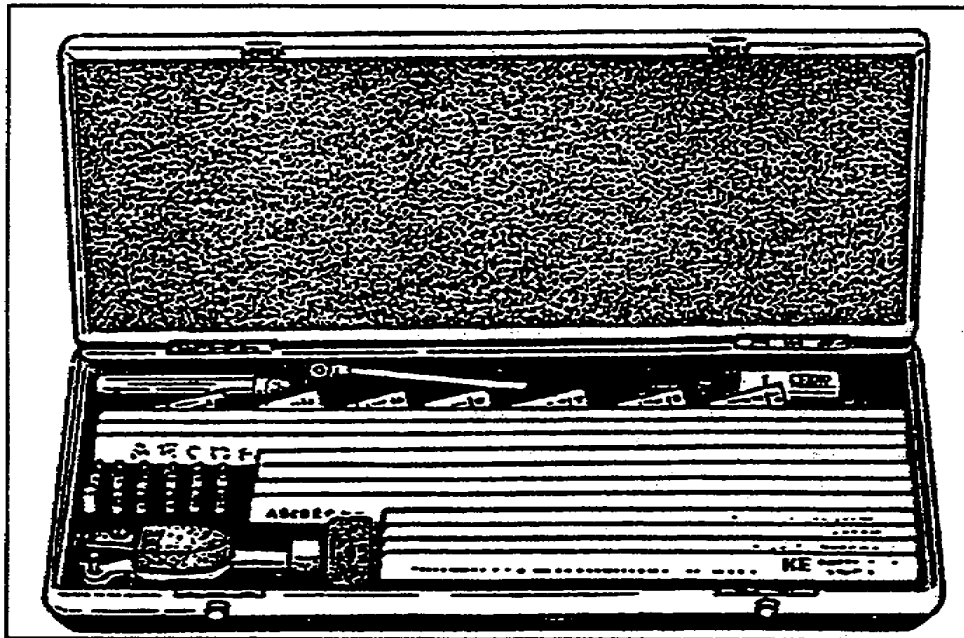


Figure 3-1. Leroy lettering set

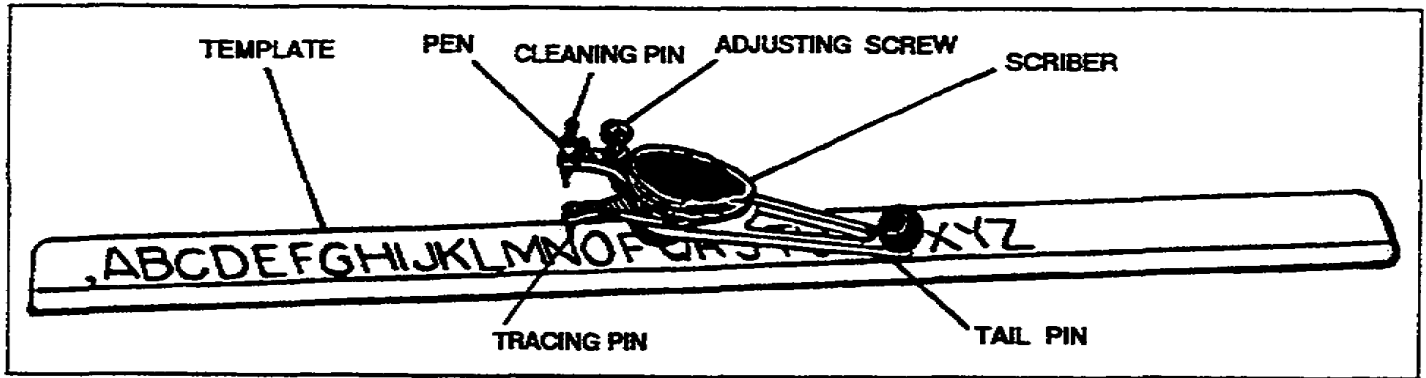


Figure 3-2. Leroy pen and template

a. Three-Legged, Adjustable Scriber. One leg holds the pen or pencil, the other two legs are tracer points. One of the tracer points rides in the straight groove etched across the bottom of the template. This point also serves as the swivel point for the scriber. The other tracer point traces the letters etched in the template. As you rotate the scriber by following the contours of the letter, the leg holding the pen or pencil replicates the letter on the work surface.

b. Pens and Pen Holders. There is an adjusting screw mounted on the same leg of the scriber containing the pen and holder. The purpose of this adjusting screw is to position the pen or pencil correctly relational to the work surface. Adjust this screw so that the pen or pencil makes light, but constant contact with the work. Use a piece of scrap paper and adjust the pen until you achieve the correct contact. The pens are vertical and held in place by a clamping screw. Tighten this screw until the pen does not move. Do not overtighten this screw or you will damage the pen or pencil. To use the Leroy set correctly, you must select the proper pen for the template you use. Use figure 3-3 to select the correct pen.

3. Using the Leroy Set.

a. Introduction. The adjusting screw controls how much pressure or contact the pen point makes on the drawing surface. You set the adjusting screw so the tip of the cleaning pin just touches the drawing surface. If the pen point exerts too much pressure on the drawing surface, the pen may cut grooves on the drawing surface and too much ink flows from the pen. When too much ink flows from the pen's reservoir, the letters have a tendency to run and smear. The Leroy set also has the capability to letter italics. To letter italics, you adjust the slant of the scriber's tracer arm to 22 1/2°.

<u>Template</u>		<u>Pen Size</u>	
80		00	
100		00	
120		0	
140		1	
175		2	
200		3	
240		3	
290		4	
350		4	
425		5	
500		6	

TEMPLATE	60	80	100	120	140	175	200	240	290	350	425	500
PEN SIZE	000	00	00	0	1	2	3	3	4	4	5	6

PEN THICKNESS

Figure 3-3. Leroy template to pen size correlation

b. Step-by-Step Use of the Leroy Set. After you have determined the letter requirements and correctly fastened the graphics project to the drawing surface, you can letter the project using the Leroy lettering set. Use characters of uniform height, thickness, and slant by performing the steps listed in the following paragraphs:

(1) Draw the correct size guidelines for the lettering you have chosen for the project. Remember from lesson I that you measure the height of letters in points and that there are 72 points to the inch. Given this, each point is approximately equal to 13.8 thousandths of an inch. Use this information to convert Leroy letter guide sizes to points. Example, your task calls for an 18 point letter. To identify the Leroy guide closest to this, multiply 18 points by 13.8 thousandths per point. The result is 248.4 thousandths. Therefore, you would use the size 240 template.

(2) Lay the selected template along the top edge of a T square or the straight edge of a drafting machine.

(3) Select the pen appropriate to the template you use as figure 3-3 identifies.

(4) Insert the selected pen into the socket of the scribe arm until the shoulder of the pen rests on the scribe arm.

(5) Tighten the screw on the side of the scribe arm.

(6) Loosen the locknut on the adjusting screw in the scribe arm.

(7) Set the tailpin of the scribe in the straight guide groove of the template.

(8) Set the tracer pin of the scribe in the groove of the character you will letter.

(9) Lower the pen gently to the surface of the drawing paper.

(10) Raise or lower the scribe arm by turning the adjusting screw until the tip of the cleaning pin within the pen just touches the drawing surface. Tighten the locknut when the pen reaches the desired height.

NOTE: To prevent blotting, make this adjustment before inking the pen.

(11) Remove the scribe from the template.

(12) Fill the reservoir of the pen with ink. Use the same procedure to ink the Leroy pen as you use to ink speedball pens or other common drafting instruments.

(13) Wipe the pen with a lint-free cloth to remove excess ink.

(14) Gently lower the pen to the drawing surface after you have inserted the tail and tracer pins into the proper grooves.

(15) Letter the project by moving the tracer pin in the grooves of the characters. Be sure to keep the tail pin in the straight groove.

e. Caring for the Leroy Set.

(1) If you must discontinue lettering for a short period, cover the tip of the pen with moist cotton while it is still in the scribe. This ensures smooth lettering and ink flow when you resume work.

When you have completed the project, remove the pen from the scribe and clean the pen by flushing it with the cleaning solution appropriate to the ink you used. Do not flush the pen in a sink. These pens are very small and it is easy to drop them down the drain. Either a syringe or eye dropper is a good tool to clean Leroy pens. Return all parts of the Leroy set to their case and store the case in its proper location.

4. Options for the Leroy Lettering Set.

As mentioned earlier in this part, the largest lettering guide provided with the standard Leroy lettering set is 500. The following guides are available as options. Figure 3-4 lists these optional guides with the appropriate pen size.

<u>Template</u>	<u>Pen Size</u>
700	8
1000	10
1350	12
2000	14

Figure 3-4. Optional Leroy lettering guides

a. Another option available for the Leroy lettering set is the letter-size adapter. With this adapter, you can increase or decrease the size of characters you prepare with any of the templates. With this tool, you can create letters in sizes between $\frac{1}{3}$ smaller and $\frac{1}{3}$ larger than the template you are using (from $66\frac{2}{3}$ percent to $133\frac{1}{3}$ percent). For example, you are using a size 300 template. Using this template and the letter-size adapter, you can create letters that range in size from 200 to 400.

b. There is also an adjustable scribe available. With this scribe, you can create letters from 60 percent to 150 percent of the height of the template you are using. For example, you are using a size 300 template. With this template and the adjustable scribe, you can create characters as small as 180 to as large as 450. Another feature of this tool is that you can slant letters as much as 45 degrees.

5. Other Mechanical Lettering Tools.

a. Other Lettering Machines. Other mechanical means of producing lettering are the Kroy or Merlin pressure lettering machines. These machines produce characters through a pressure

or dry carbon transfer process using a lettering font or wheel with various styles and sizes (8 to 36 points) of letters.

(1) Some of these font wheels print vertical lines of letters. Such letters are very handy to letter the spines of books or binders. The machine prints the characters on 1/2-inch paper or plastic strip that is clear or colored with an adhesive back and a protective, peel-off coating.

(2) These machines range from a simple, one character at a time process, to automatic with computer memory, editing functions, and a display screen. Figure 3-5 shows a pressure lettering machine.

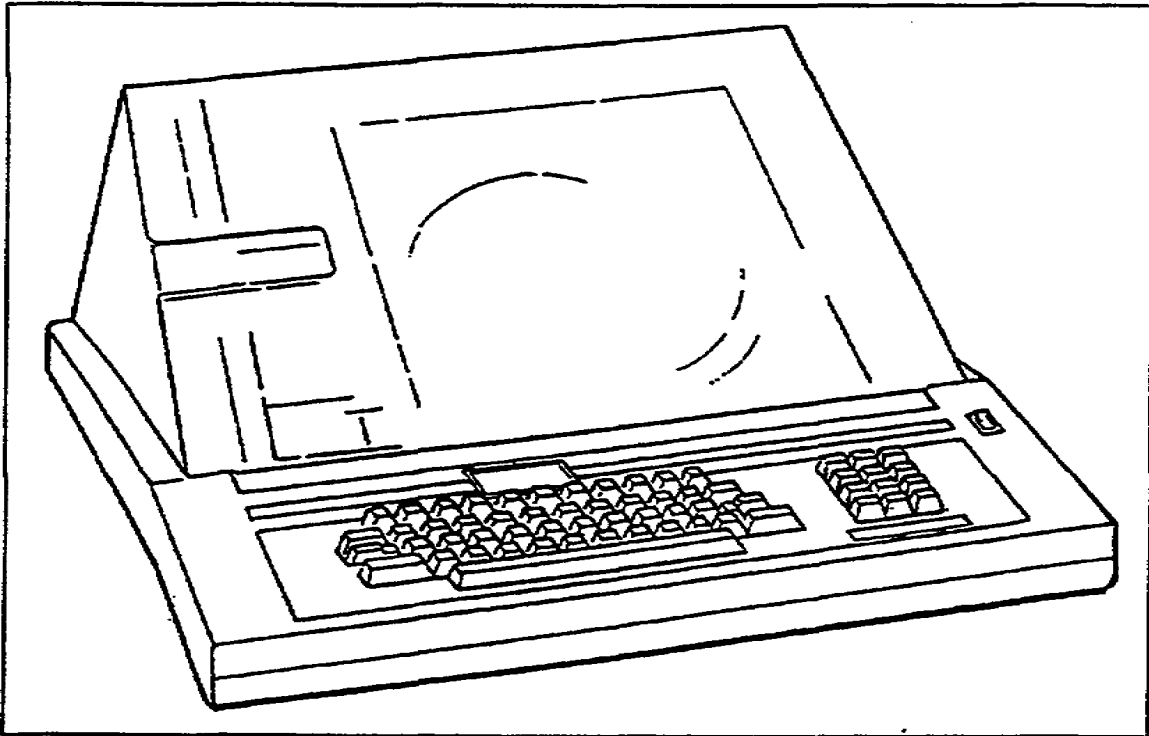


Figure 3-5. Typical pressure lettering machine

b. Making Curved Lines of Letters. The strips of letters produced by pressure lettering machines enable you to make curved lines of letters quickly and relatively simply.

(1) Draw the curved line in light pencil on your work surface. Use the lettering machine following the manufacturer's instructions and prepare the lettering. Use an "exacto" knife or single-edged razor and make a vertical cut between each letter to the bottom of the letter. Be careful not to cut all the way to the bottom or you will tear the strip when you curve it. Peel off the backing, then curve the strip of letters to follow the line on your work.

(2) If you make a mistake, and you will at some time, insert the tip of the knife or razor under one corner of the strip of letters and gently remove it. Then replace it in the proper location (refer to figure 3-6). The adhesive backing on letters prepared by pressure-sensitive lettering machines is designed to enable you to remove the letter strip from the paper without damaging either the paper or the letters. Yet it is strong enough to adhere the letters to the work surface.

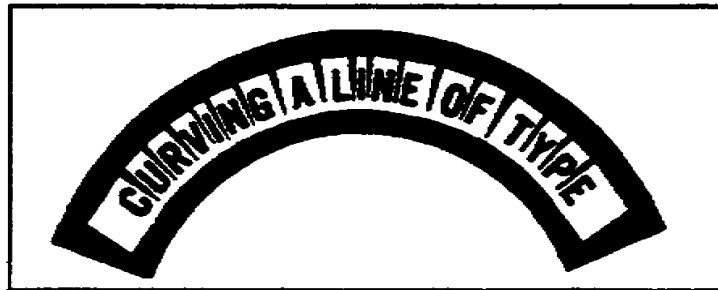


Figure 3-6. Curving a line of type

6. Prepared Lettering.

a. Introduction. As a graphics documentation specialist, you have an assortment of sizes and styles of pressure-transfer lettering sheets to choose from when lettering a graphics project using this method. A lettering sheet has the letters of the alphabet printed on the back side of a waxed acetate sheet. Each lettering sheet has a protective backing sheet to protect the letters from sticking to another letter sheet during storage.

(1) When you apply pressure-transfer lettering, the only guideline you must use is the base line. After you have determined the size and style of lettering for the graphics project, draw the base line for the letters. Then remove the protective backing from the lettering sheet, align one letter at a time with the guidelines, burnish the letter into place with a plastic burnishing tool, and lift the letter sheet (figure 3-7).

(2) If you do not have access to a plastic burnishing tool, you may use any rod-like object with a narrow, round end (e.g., the end of a comb). When burnishing a letter on the lettering sheet, ensure you burnish only the letter you must transfer to the graphics project. If you burnish two or more letters simultaneously, they may stick or not align correctly.

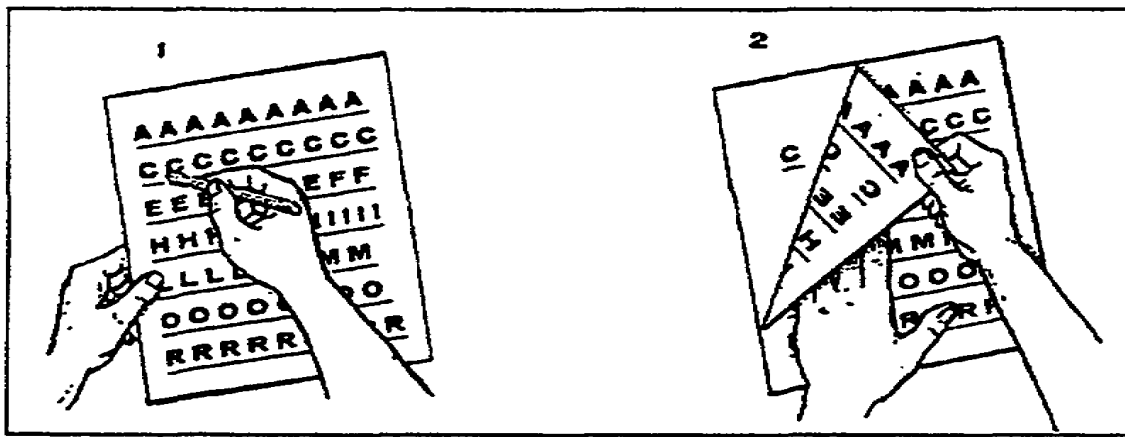


Figure 3-7. Burnishing a letter into place

(3) Do not use a pencil as a burnishing tool. Pencils leave graphite on the lettering sheets that could transfer to the graphics project and ruin the project.

b. Making Corrections. If you apply the incorrect letter, remove it by applying masking tape over the incorrect letter and carefully lifting it up with the masking tape. Then insert the correct letter in the space.

c. Uses of Lettering Sheets. Pressure-transfer lettering sheets provide quality letters for indoor use. However, you should only use them for small jobs since they require much time to apply and have a limited number of each letter on a sheet.

7. Summary.

This completes the discussion of mechanical and prepared lettering. With the advent and wide availability of personal computers, many projects formerly done using such techniques are losing popularity. However, you may find yourself in a situation where the computer may not be available and you must retain your mastery of the techniques you learned in this part of the lesson.

PART B - USE AND APPLICATION OF COMPUTER-GENERATED LETTERING TECHNIQUES

The first personal computer was introduced in the work place in 1977. No one then could envision the role it would play in the life of nearly every American in the 15 short years since its invention. The personal computer has replaced or soon will replace almost every common tool found in the office environment. As a lettering tool, it is unsurpassed in speed and diversity. With the use of a mouse or with a few key strokes, you

can create and edit documents consisting of many fonts in various sizes. You can scan in art or other images and insert them into your document.

For example, this subcourse includes figures that were scanned and saved as a graphics file, then imported into the text. You can purchase diskettes with symbols and graphic pictures called clip art and use them in a variety of application programs such as word processing and desk-top publishing. You also can buy libraries of font sets that can be used with other programs. It is essential that all illustrators have at least a working knowledge of some terms common to most lettering and graphics software programs. If this knowledge is not required for your military occupational specialty (MOS) at this time, it may be in the future. Obviously, a thorough discussion of any software application is beyond the scope of this subcourse. However, the information included in this part is designed to familiarize you with the common terms and procedures. This information will make it easier for you to learn to use specific programs.

8. Fonts.

You learned in lesson 1 that the word font describes a set of typefaces such as Roman or Gothic. It has the same meaning with respect to computers. However, to understand how the computer deals with fonts you must learn some additional terms. These terms describe attributes particular to handling fonts in computers and the related software programs.

a. Soft Fonts. Soft fonts, sometimes known as downloadable fonts, are resident in the computer, not in the printer. You can store these fonts in a separate directory in a computer and use them with numerous applications. For example, you can purchase a variety of fonts stored on floppy disks. Once you load them on the computer's hard disk, you can use them with any compatible software and hardware. Following the software vendor's instruction, you download (load) the fonts you need to use in your document to the printer. The advantage of soft fonts is that storage (memory) space on the hard disk is less expensive than memory in the computer.

b. Hard Fonts. Hard fonts, also known as resident fonts, are stored in the printer rather than in the computer. You select hard fonts for your document through printer control software or through switches on the printer's front panel. Some laser printers have hard fonts available in cartridges. To switch fonts, you switch cartridges. In all cases, follow the manufacturer's instructions.

c. Scalable Fonts. Some software programs include the ability to size (change the scale) fonts through keyboard controls. With most scalable fonts, the size you see on the computer screen (monitor) is the same size as the finished document. This is referred to as "what you see is what you get" (WYSIWYG). Scalable fonts are normally available with desktop publishing software such as Ventura.

d. Proportional Fonts. Proportional fonts assign more space to wider letters than they do to thinner letters. The font this subcourse is prepared in is courier. Courier is a fixed font, all letters are assigned the same amount of space.

Appendix C provides a comparison between fixed and proportional fonts. There are no particular advantages or disadvantages to either fixed or proportional fonts. The choice is a personal one.

e. Font Sizes. The font sizes used in most computer programs are expressed in points just as they are in hand and mechanical lettering. One exception to this is Harvard Graphics. This software program uses sizes that are expressed as a percentage of the narrowest margin in the paper size selected. Standard paper is 8 1/2 inches by 11 inches and the narrowest margin is 8 1/2 inches whether you are printing in the portrait mode (8 1/2 inches wide by 11 inches high) or the landscape mode (11 wide by 8 1/2 inches high).

f. In Harvard Graphics, a letter 8 1/2 inches high equals size 100. In points, this would be 72 points per inch times 8.5 inches or 612 points. The question now is how to convert from points to size and vice versa. The key to this conversion is percentage. Remember that the size used in Harvard Graphics represents a percent of the narrowest size of the paper. Using this information you then can convert from points to size regardless of the dimensions of the paper you use.

(1) First calculate the number of points contained in the narrowest dimension of the paper. Example: 8.5 inches multiplied by 72 points per inch equals 612 points.

(2) Next, divide the height of the desired letter (in points) by the number of points contained in the narrowest dimension of the paper and multiply the result by 100 (to convert it to a percent). Round your answer to one decimal place. In this example, 612 points. If you want to create a letter 72 points high (1 inch), then divide this number by 612. The result is .1176. Now multiply this by 100 giving you an answer of 11.76, rounded to one decimal place is 11.8. This is the size you would enter in Harvard Graphics to create a letter 72 points high.

9. Block Operations.

The capability to perform block operations is one of the most useful features of text management software. A block can be as small as a single character or as large as an entire document. You use block operations to delete text, move text, and copy text. In some word processors you can even move blocks of text from one file to another. This block operation is called an external copy.

a. In general, the block operation requires you to move the cursor to the beginning of the text to block. If you are using WordPerfect, you then press the Alt-F4 function key to turn on the block option. Next, you move the cursor to the end of the text you wish to block and press the Ctrl-F4 function key to choose what block operation to perform (i.e., move, copy, delete). In some word processors you may have to depress another function key at this time.

b. Another application of block operations is to format (change or assign attributes) blocks of text such as paragraphs. The following paragraphs describe some common paragraph formats.

(1) Centering text. You can center a line or a line of text with a few key strokes. In WordPerfect for example, you move the cursor to the first character in the line of text to be centered. Then, press the Shift-F6 function key and the computer executes the command.

(2) Justifying text. A paragraph of justified text is one in which both the left and right margins are flush (even). Appendix C provides an example of a justified paragraph. Text paragraphs are normally left flush. This paragraph is left justified. With some word processors you can justify either the left margin, the right margin, or both.

c. Summary. Word processing programs provide you, the user, with the ability to create a wide variety of documents from letters to entire manuals. They include such features as spell checking, automatic pagination, and numerous other features including the ability to import graphics directly into the document for printing. Just as with hand lettering, it takes practice and training to become a proficient user.

10. File Types.

The last topic in this lesson is file types. Data can be stored in the computer in many different ways. However, not all software can use all the different types of files. Some software

programs can use or create only text files, others only graphic files, and yet others can use and create both. You identify file types by the file extension. The file extension is a three character code that follows the file name, separated by a decimal (.). For example, you can assign the file name MEMO.DOC to a memorandum. The DOC extension identifies this file as a text file. The following paragraphs identify some of the common graphic files. Remember, always refer to the software users manual to determine what type of files you can use with a specific software package.

a. PCX files are widely used in graphics programs. These files store graphics images as patterns of dots (bitmapped). When you scale these files to a larger size, the lines and images appear to have ragged edges.

b. IMG files are also bitmapped files and are used by the Ventura desktop publishing program and others.

c. TIFF, that stands for tagged image file format, is a graphic file type. Many word processing packages have the capability to import this type of graphics file.

d. CGM, that stands for computer graphics metafile, is an object graphics format. Object format means that the image is stored as a geometric shape and for this reason, retains its clarity when you scale it to a larger or smaller size.

11. Summary.

This completes lesson 3 and the subcourse. Before beginning the examination, complete the practice exercise found on the following pages and compare your answers with those on the answer key and feedback sheet. If any of your answers are incorrect, review the area indicated until you understand the material.

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LESSON 3

PRACTICE EXERCISE

The following items will test your grasp of the material covered in this lesson. There is only one correct answer for each item. When you complete the exercise, check your answer with the answer key that follows. If you answer any item incorrectly, study again that part of the lesson which contains the portion involved.

1. You are lettering a project using a Leroy set. The letters are to be 36 points high. Which size template and pen should you use?
 - A. 100,0
 - B. 200,3
 - C. 350,4
 - D. 500,6
2. Available to you is a standard Leroy set and an optional adjustable scribe. What is the largest size letter, in thousands of an inch, you can create with these tools?
 - A. 500
 - B. 675
 - C. 750
 - D. 900
3. There are several terms that describe the fonts installed in printers and computers. Which of the following terms describes the font you use that assigns more space to wide letters than to narrow letters?
 - A. Soft fonts
 - B. Hard fonts
 - C. Scalable fonts
 - D. Proportional fonts
4. You are using Harvard Graphics software to letter a project. Your paper is 10 by 12 inches. You need to produce letters that are 72 points high. Which size letter do you select from the menu?
 - A. 8
 - B. 10
 - C. 12
 - D. 14

LESSON 3

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

<u>Item</u>	<u>Correct Answer and Feedback</u>
1.	D. 500,6 To answer this item correctly requires two steps. First you must convert points to thousands of an inch. To do this, multiply 36 by 13.6; the result is 489.6; the closest template is size 500. You may also remember that 36 points is 1/2 inch, and that 500 is 1/2 of one thousand and therefore, is also 1/2 inch. The second part of this item requires you to refer to figure 3-3 and select the proper pen point for the template (page 3-4, para 3b(1) and figure 3-3).
2.	C. 750 The largest template provided with a standard Leroy set is 500. The adjustable scribe provides the capability to increase this by 150% or 1.5 times (500 x 1.5 is 750) (page 3-6, para 4b).
3.	D. Proportional fonts Proportional fonts follow instructions imbedded in the computer to assign space to letters. Instructions are similar to those you learned in this subcourse (page 3-11, para 8d and appendix C).
4.	B. 10 To correctly respond to this item you must understand that the size of a letter produced by Harvard Graphics is a function of the paper size. If you desire a letter that is 72 points (1 inch high) you must calculate this as a function of the paper size. In this situation 1 inch divided by 10 inches is 10%. Therefore, select size 10 letters (page 3-11, para 8f(2)).

APPENDIX A - LIST OF ACRONYMS AND FILE EXTENSIONS
APPENDIX B - GUIDELINES AND GRIDS
APPENDIX C - FIXED PROPORTIONAL FONTS AND
PARAGRAPH FORMATS

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APPENDIX A - LIST OF ACRONYMS AND FILE EXTENSIONS

ACCP	Army Correspondence Course Program
CGM	computer graphics metafile
IMG	Image
MOS	military occupational specialty
NAVEDTRA	Naval Education and Training
PCX	PC paintbrush
TIFF	tagged image file format
WYSIWYG	what you see is what you get

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APPENDIX B - GUIDELINES AND GRIDS

CAP LINE

WAIST LINE

BASE LINE

DROP LINE

B-1

SS 0525

CAP LINE

WAIST LINE

BASE LINE

DROP LINE

CAP LINE

WAIST LINE

BASE LINE

DROP LINE

CAP LINE

WAIST LINE

BASE LINE

DROP LINE

Blank lined area for drawing or notes.

CAP LINE

WAIST LINE

BASE LINE

DROP LINE

WALSH LINE

BASE LINE

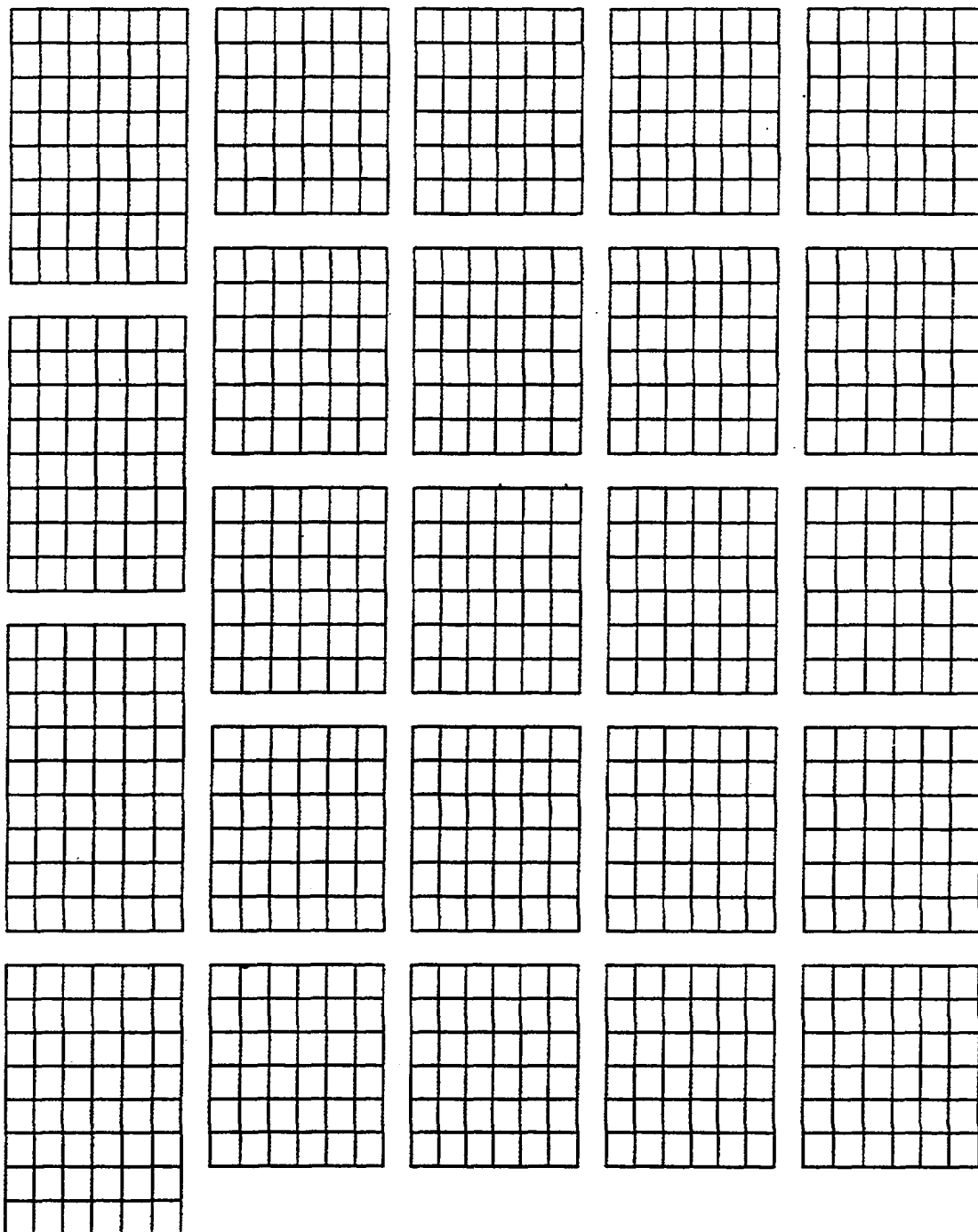
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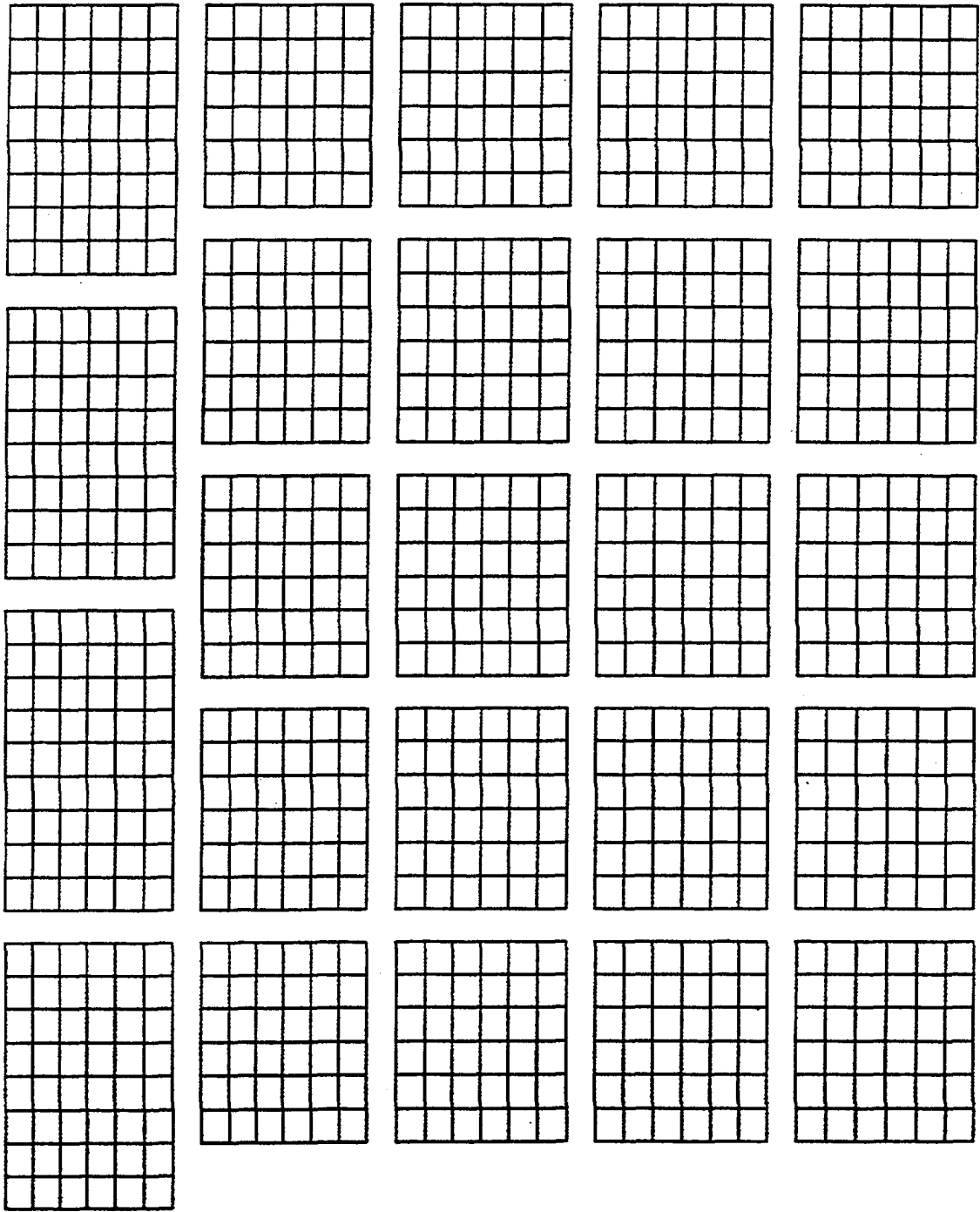
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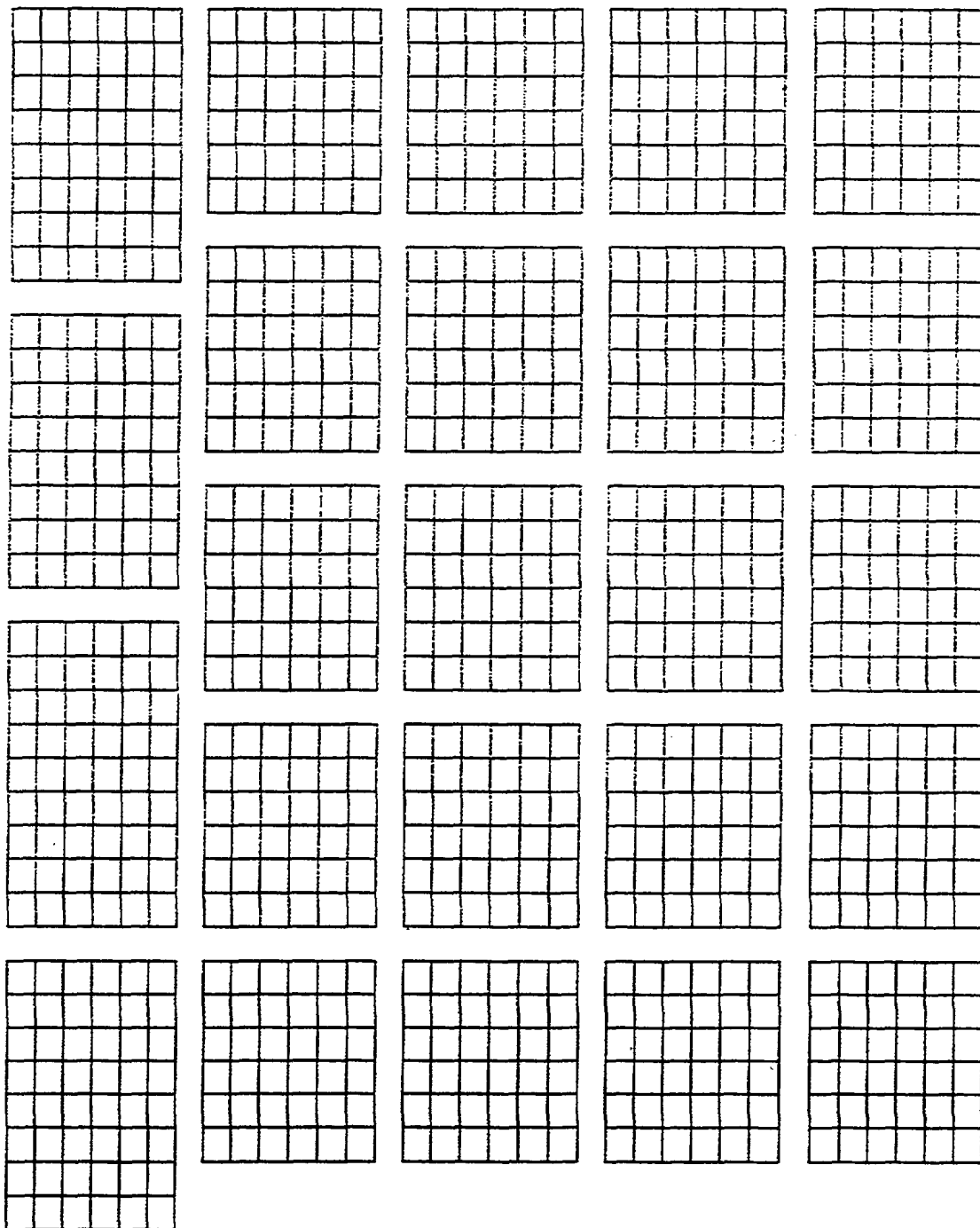
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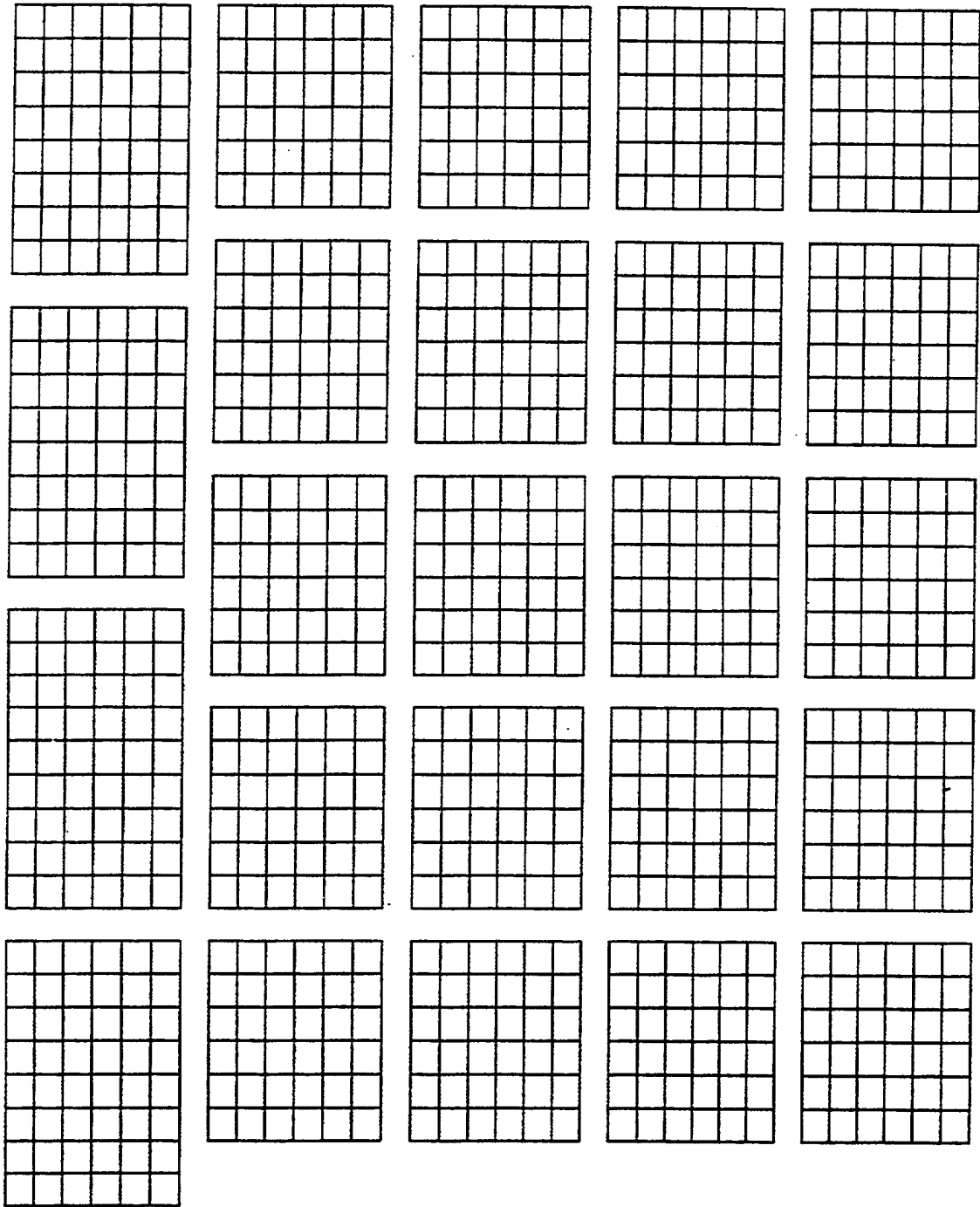
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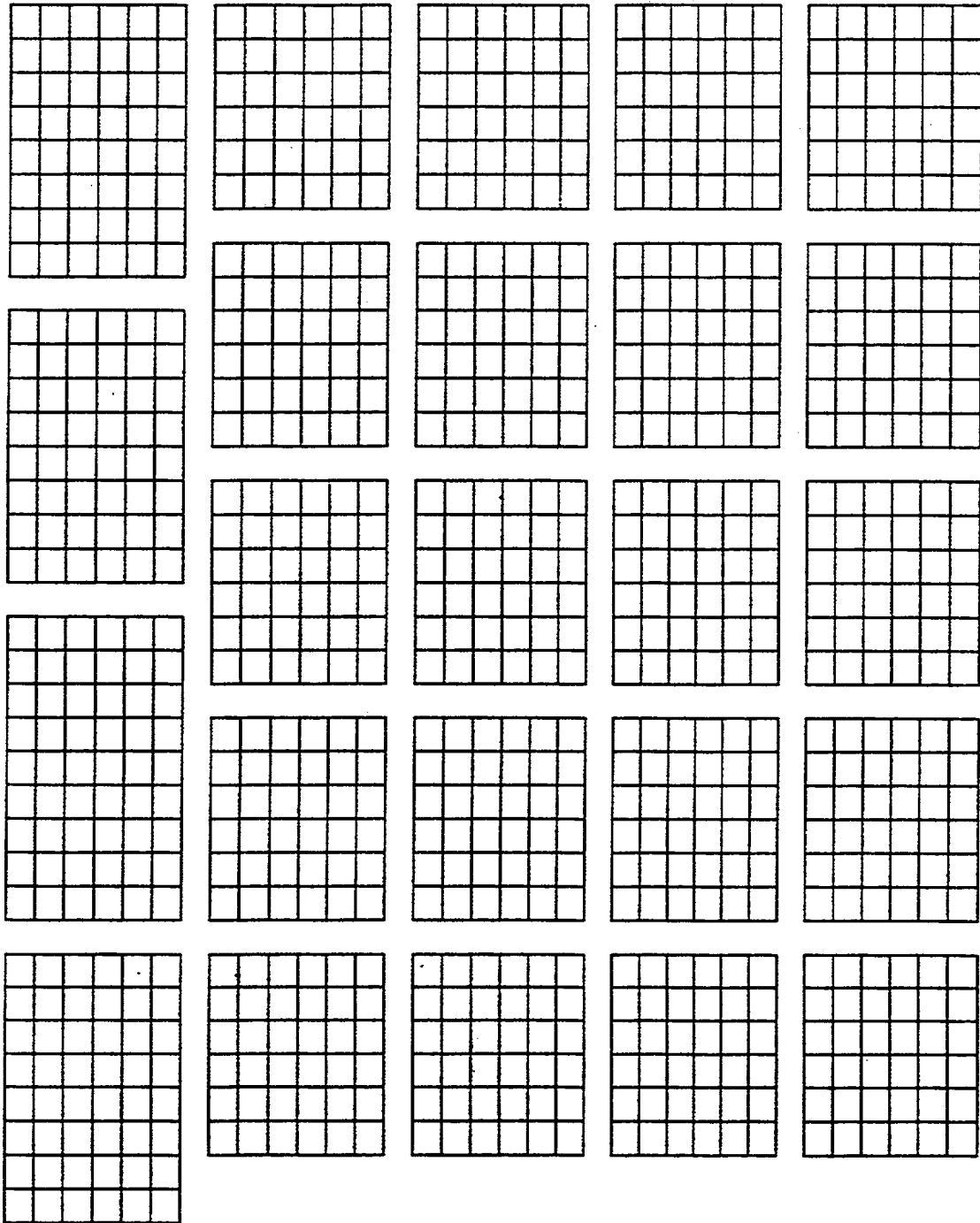
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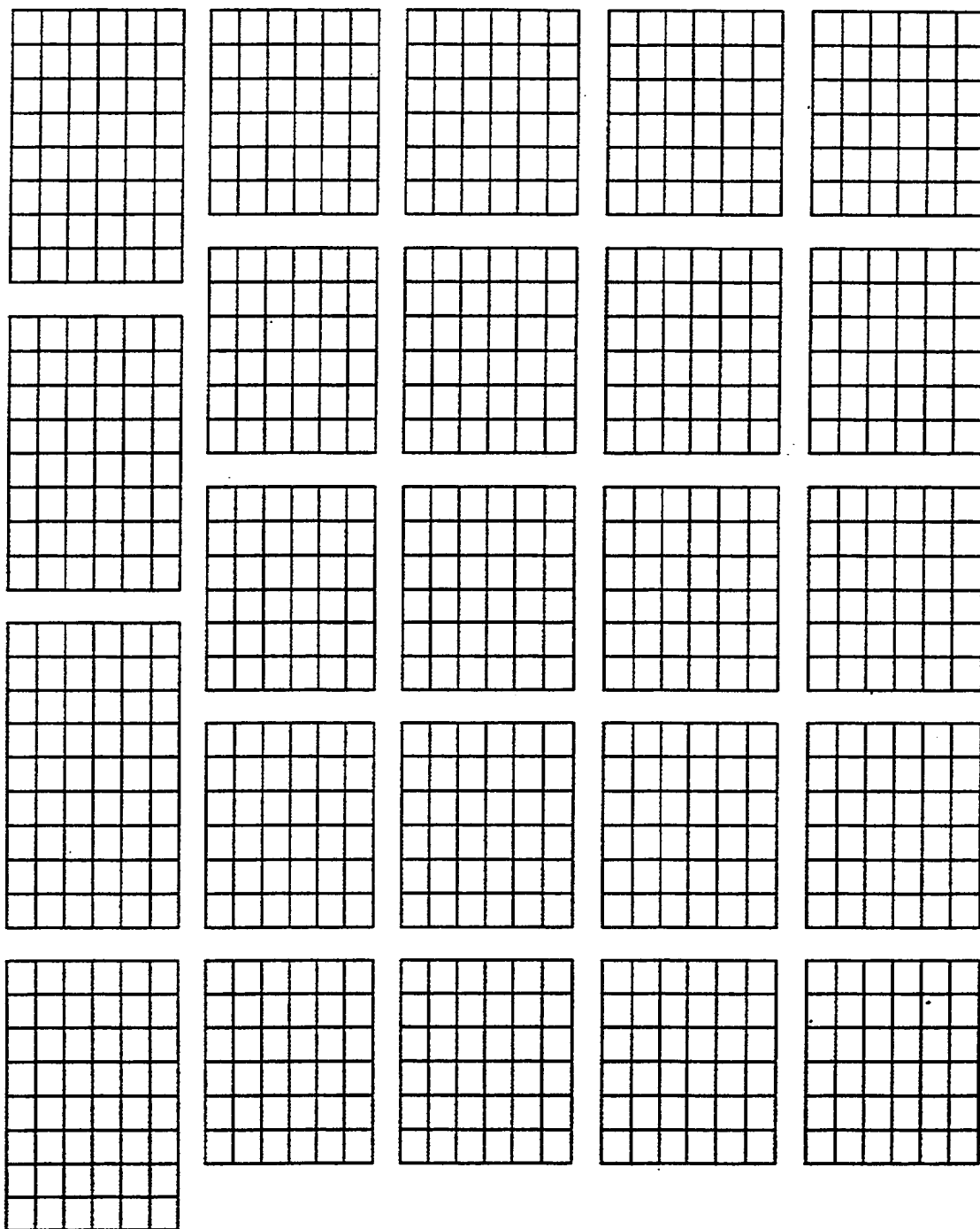












APPENDIX C - FIXED PROPORTIONAL FONTS AND PARAGRAPH FORMATS

1. The following paragraph is an example of a fixed font format (Courier). This paragraph is left justified.

Compared to hand lettering, both mechanical and prepared letters provide you the advantage of producing uniform letters. There are several methods of producing letters mechanically. In this lesson, you will learn the most common methods. To effectively use these methods, you must develop the necessary skills. As with hand lettering, you must practice using mechanical lettering tools in order to become proficient.

2. The following paragraph is an example of a proportional font format (Roman). This paragraph is left justified.

Compared to hand lettering, both mechanical and prepared letters provide you the advantage of producing uniform letters. There are several methods of producing letters mechanically. In this lesson, you will learn the most common methods. To effectively use these methods, you must develop the necessary skills. As with hand lettering, you must practice using mechanical lettering tools in order to become proficient.

3. The following paragraph is an example of a fixed font format (Courier). This paragraph is left and right justified.

Compared to hand lettering, both mechanical and prepared letters provide you the advantage of producing uniform letters. There are several methods of producing letters mechanically. In this lesson, you will learn the most common methods. To effectively use these methods, you must develop the necessary skills. As with hand lettering, you must practice using mechanical lettering tools in order to become proficient.

4. The following paragraph is an example of a proportional font format (Roman). This paragraph is left and right justified.

Compared to hand lettering, both mechanical and prepared letters provide you the advantage of producing uniform letters. There are several methods of producing letters mechanically. In this lesson, you will learn the most common methods. To effectively use these methods, you must develop the necessary skills. As with hand lettering, you must practice using mechanical lettering tools in order to become proficient.