

LETTERING FOR ENGINEERS

Lettering. Lettering is an essential requirement in engineering work of all kinds. This is especially true of drawings, where legibility is needed for rapid and accurate understanding. Regardless of how expertly the line work may have been executed, its appearance and usefulness are naturally damaged by sub-standard lettering. Well executed letters and figures will greatly improve the appearance of any drawing. The main function of letters and figures is to give complete information as to size, location, material, kinds of finish, accuracy, methods of assembling, number required, various or special notes and titles. Legible letters, executed with speed, have been established as standard practice for technical drawings, maps, graphic charts, and other professional engineering records. Charles W. Reinhardt has received credit for having simplified the forms of lettering that is used today by engineers.

Other forms of letters that are used by engineers, architects, designers and artists include Old Roman, Modern Roman, Gothic, Old English and "Commercial Gothic" (Fig. 1).

Single-stroke letters are composed of uniform width lines or stems as formed by the pencil. The term **Single-Stroke Commercial Gothic** is often applied to such letters. Single-stroke letters are standard for most engineering purposes and will be treated in detail.

Two styles of single-stroke commercial Gothic letters are in general use by the design engineer: the vertical style in which all letters are capitals and lower-case, and the inclined style which may be all capitals or lower-case.

The purpose of this unit is to teach the shape of the different letters and numerals and also, the sequence and directions of the strokes used to form them. Horizontal guide lines are always used to control a uniform height for the letters. For the Vertical style of lettering, vertical guide lines are used. The vertical stroke of the letters should be parallel with the vertical guide lines.

The civil engineer uses engineering graphics as a graphical language which uses lines, symbols, dimensions and notations to describe accurately an object. The lines and symbols are drawn with professional drawing instruments and tools, the dimensions, notes, titles, bills of materials and technical specifications are lettered on the working drawing freehand. Lettering will be used instead of writing because it is more legible. For most types of drawings, single-stroke Commercial Gothic letters will be used. These letters are formed by straight and curved strokes of uniform width. With practice, they can be executed with ease and rapidity.

Remember, good lettering adds much to the

ABCDEFGHIJKLMN
OPQRSTUVWXYZ&
abcdefghijklmnopqrs
tuvwxyz\$¢%/“”!?.,:-()

1234567890

Old Roman

ABCDEFGHIJKLMN
OPQRSTUVWXYZ&
abcdefghijklmnopqrs
tuvwxyz%/£.,,:;!?“”-()*[]

1234567890\$¢

Modern Roman

ABCDEFGHIJKLMN
OPQRSTUVWXYZ&

!?.,:;“”’-()...°/‰+

1234567890

Gothic

Fig. 1 Forms of letters.

ABCDEFGHIJKLMN
OPQRSTUVWXYZ&
abcdefghijklmnopqrs
tuvwxyz\$¢%/£*“”!?.,:-()

1234567890

Old English

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
abcdefghijklmnopqrs
tuvwxyz\$¢%/£*“”!?.,:-()

1234567890

Commercial Gothic

attractive appearance of a drawing. Careless or poor lettering may spoil an otherwise excellent drawing. Skill and speed in lettering can only be acquired through painstaking practice.

VERTICAL CAPITAL LETTERING

Vertical Capitals. Single stroke vertical capitals may be divided into groups for studying. The letters may have an assumed height of six units and may be arranged on the basis of width. Use five units as a normal width. Letters are sometimes made either narrower or wider in order to appear well when put together in words. The difference in shapes and in number and position of the various lines, make it necessary to understand the characteristics of each letter and the effect of each letter upon the ones with which it is used.

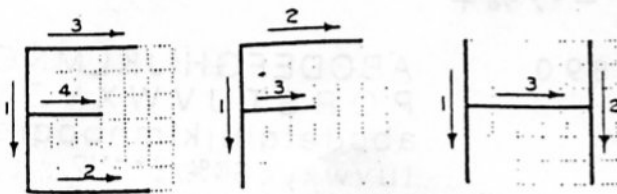
Normal width letters include B, C, D, E, F, G, H, J, K, L, N, P, R, S, U, and Z. Less than normal width letters include the I. Greater than normal width letters include A, M, O, Q, T, V, W, X and Y. The letter W is eight units wide, being the widest letter of the alphabet. The letters A, M, O, Q, T, V, X and Y are "square" letters as they are six units wide. The width of the M is often increased by a 1/2 unit.

The effects of proportion and stability of area occupied must be considered when making the letters. The bar for the B, E, and H is placed above the middle so that the letters don't look top heavy in appearance. The top line of the E is made a little shorter than the bottom line and the upper portion of the S is made smaller than the lower portion. The bar of the P and the R are placed at the middle. The K, X and Z are smaller in width at the top than at the bottom.

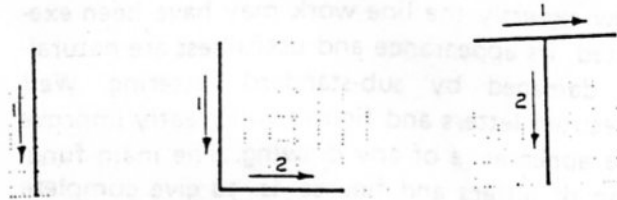
VERTICAL CAPITAL LETTERS

E F H I L T

Letters formed with vertical and horizontal strokes.



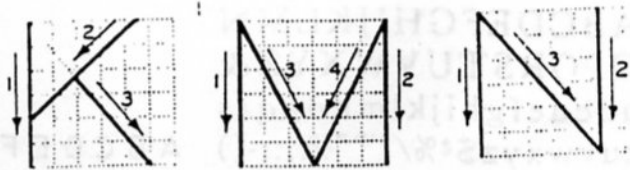
- E -- The third stroke is shorter than the second stroke. The fourth stroke should be slightly above the middle and 3 units long. (5 units wide)
- F -- The third stroke should be slightly above the middle and about 3 units long. (5 units wide)
- H -- The third stroke should be slightly above the middle. (5 units wide)



- I -- The letter I is a single vertical line made with a down stroke.
- L -- The L may be made with two strokes, or in one stroke if the height is small. When making this letter, guard against the tendency of the horizontal line to slope upward or downward and don't hesitate at the end of the stroke. (5 units wide)
- T -- Learn to locate the center of the horizontal stroke quickly and don't hesitate between the two strokes of the T. (6 units wide)

K M N X Z

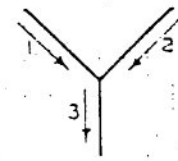
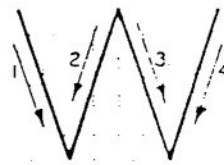
Letters formed with vertical, horizontal and oblique strokes.



- K -- This letter is not full width at the top. The second stroke ends 2 units up from the bottom. The third stroke starts at the top of the first stroke. Some start the third stroke at the middle of the second stroke if the height is small. (5 units wide)

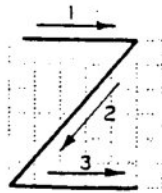
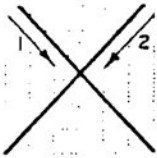
M -- The two outside strokes are usually made first. The incline strokes should meet at the center of the width and on the bottom guide line. Some engineers make this letter slightly wider if the height is smaller than normal. (6 units wide)

N -- The two vertical strokes are usually made first. This permits a more accurate estimate of the width of the letter. The inside line joins the top and bottom of the two parallel lines. (5 units wide)



W -- Make the first "V" of this letter one-half the total width of the letter, which is 8 units wide. Strokes 3 and 4 should be drawn parallel to strokes 1 and 2. (8 units wide)

Y -- Strokes 1 and 2 should meet in the middle of the height and make equal angles with stroke 3. (6 units wide)

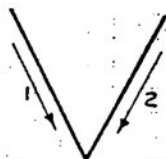
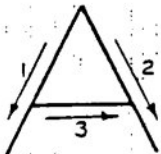


X -- This letter is not full width at the top, therefore, the two strokes meet at a point above the center. (6 units wide)

Z -- The first stroke is $4\frac{1}{2}$ units long and is centered over the third stroke. The third stroke should be made immediately after the other or in one motion if the height is small. Some prefer to make the inclined stroke last. (5 units wide)

A V W Y

Letters formed with oblique strokes.

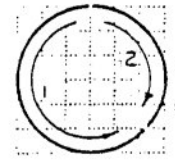
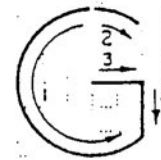
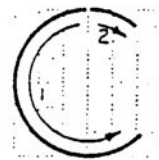


A -- This letter points to the center of the top guide line and has its third stroke located about one-third the height. (6 units wide)

V -- The two strokes meet at the center of the width on the bottom guide line. (6 units wide)

C G O O S

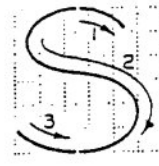
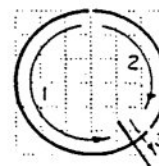
Letters formed with curved strokes.



C -- Based on the O. A two stroke letter. (5 units wide)

G -- Based on the O. Bar of stroke 3 is at the middle of height, and the vertical part or stroke 4 extends downward about 2 units. (5 units wide)

O -- Start at the top of the letter, continue down to the left and around to the right. Stroke 2 will be a short stroke. (6 units wide)

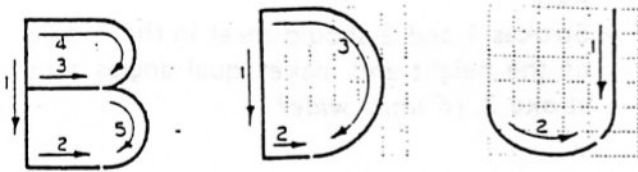


Q -- Same as the O with a kern added. (6 units wide)

S -- May be formed from an ellipse. Make the upper part smaller than the lower part so that the letter will not look top heavy. (5 units wide)

B D J P R U

Letters formed with combined straight and curved strokes.



B -- Stroke 2 and 3 at right angles to stroke 1. They are straight lines, while stroke 4 is straight and curved. Stroke 5 is a circle tangent to the horizontal strokes. Stroke 3 is above the middle and the upper portion is less than 5 units wide. (5 units wide)

D -- Strokes 2 and 3 must be straight and start at right angles to stroke 1. (5 units wide)

J -- Stroke 1 must be straight and make a smooth joint with stroke 2. (5 units wide)



P -- Strokes 2 and 3 must start at right angles to stroke 1. Stroke 2 is in the middle. Curved portion is based on an oval and is tangent to the horizontal strokes. (5 units wide)

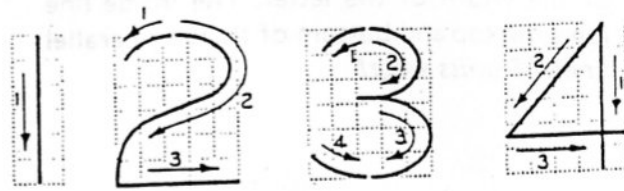
R -- Stroke 2 and 3 start at right angles to stroke 1. Stroke 2 is a straight line while stroke 3 is straight and curved. Stroke 4 if extended would meet 1 unit above stroke 3. (5 units wide)

U -- Strokes 1 and 2 are made parallel and stroke

3 makes a smooth joint that is tangent to both vertical lines. (5 units wide)

VERTICAL NUMERALS

All of the numbers are 5 units wide except 1.

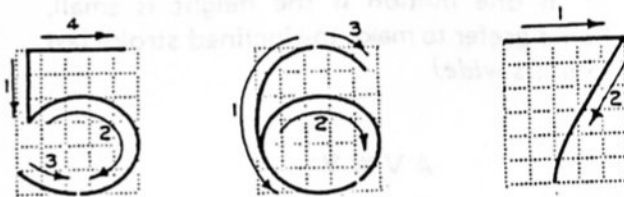


1 -- The number 1 is a single vertical line made with a downward stroke.

2 -- Stroke 1 and 2 pass through the center. The top part is not as wide as stroke 3 but is centered over the base.

3 -- The top half of the 3 is smaller than its base and it is centered over its base.

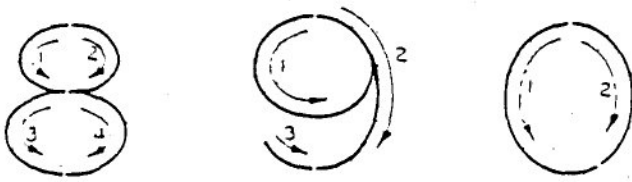
4 -- Stroke 2 of the number 4 makes approximately 45° with the vertical stroke 1. Stroke 3 is approximately $\frac{1}{4}$ the height of the number.



5 -- Stroke 4 is not as wide as the 5 but it is centered over the bottom part. The bottom portion of the 5 extends two-thirds of the height.

6 -- The body extends upward two-thirds of the height and stroke 3 doesn't extend as far to the right as the body itself.

7 -- Stroke 2 starts down toward a space 1 unit to the right of the left hand corner and then curves to a down direction that is perpendicular to stroke 1 and ends 2 units from the left.



- 8 -- The top half of the 8 is slightly smaller than the bottom half. This keeps the 8 from looking top heavy.
- 9 -- The body of the 9 is two-thirds the height of the number and stroke 3 doesn't extend as far to the left as the body itself.
- 0 -- The 0 is made in two strokes and is not as wide as an O.

VERTICAL LOWER CASE LETTERING

Small or lower-case letters are easily read because they have similar shapes. Most often they are two-thirds the height of capital letters. A line extending above the body of the letter is called an ascender and a line extending below the body is called a descender.

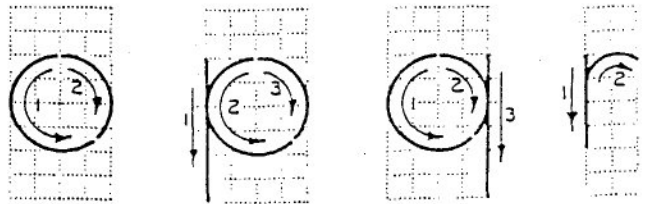
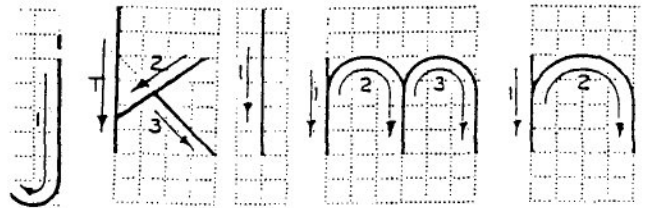
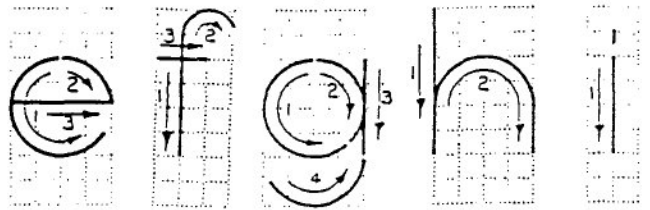
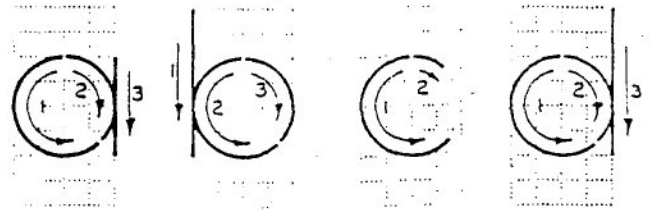
ORDER OF STROKE FOR VERTICAL LOWER CASE

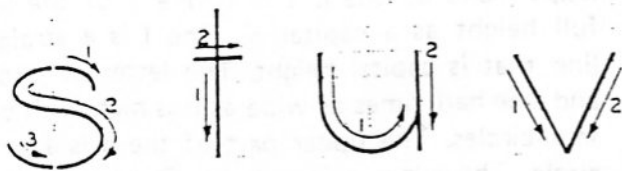
The vertical lower case letters are made up mostly of circles and straight lines. The letters a, b, d, e, g, h, k, n, o, p, q, s, u, v, x, y, and z are 4 units wide. The letter c is 3 1/2 units wide. The letter f is 3 units wide. The letter j, r, and t are 2 units wide. The letter i and l are 1 unit wide. The letter m and w are 6 units wide.

The letter c is the same as the capital C except for height. The letter e has a middle stroke that is slightly above the center. A portion of the letter f and the g are formed by the circle. The letter g is shown with 4 strokes. The letter h and n are the same except for the length of the first stroke. A semi-circle forms part of the h and n. The dot of the i is 1/2 up the height of the ascender. The j is an inverted f with a dot instead of a cross bar and a circle

helps make up the j. The stroke l of the k is full height as a capital K. The l is a straight line that is capital height. The letter m is one and one-half times as wide as it is high with two semi-circles. The upper part of the n is a semi-circle. The letter o is a circle. The p and q are straight line descenders connected to circles. The upper part of the r is part of a circle and is very similar to an incomplete n. The letter s is like a capital S except smaller. The letter t may be full height. The letter u is a semi-circle, and is an inverted n. The letters v, w and x are the same shape as the capitals except smaller. The letter y is similar to the V except it has a descender. The letter z is the same shape as the capital Z except for being smaller.

VERTICAL LOWER CASE LETTERS





guide line ratios: 3/5 : 2/5, 2/3 : 1/3, and 1 : 1. Guide lines are made by turning the disc until the desired letter height is indicated on the index, then inserting the pencil into the pre-determined holes and sliding the device along the straight-edge. Sides are at 68° angle for drawing guide lines for inclined letters and 90° for vertical letters (Fig. 2).

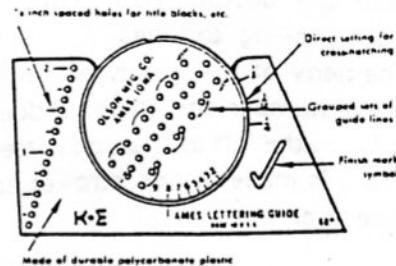
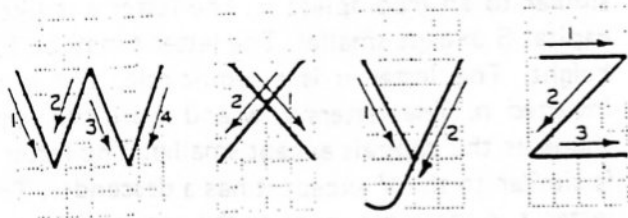


Fig. 2 Ames letter instrument.

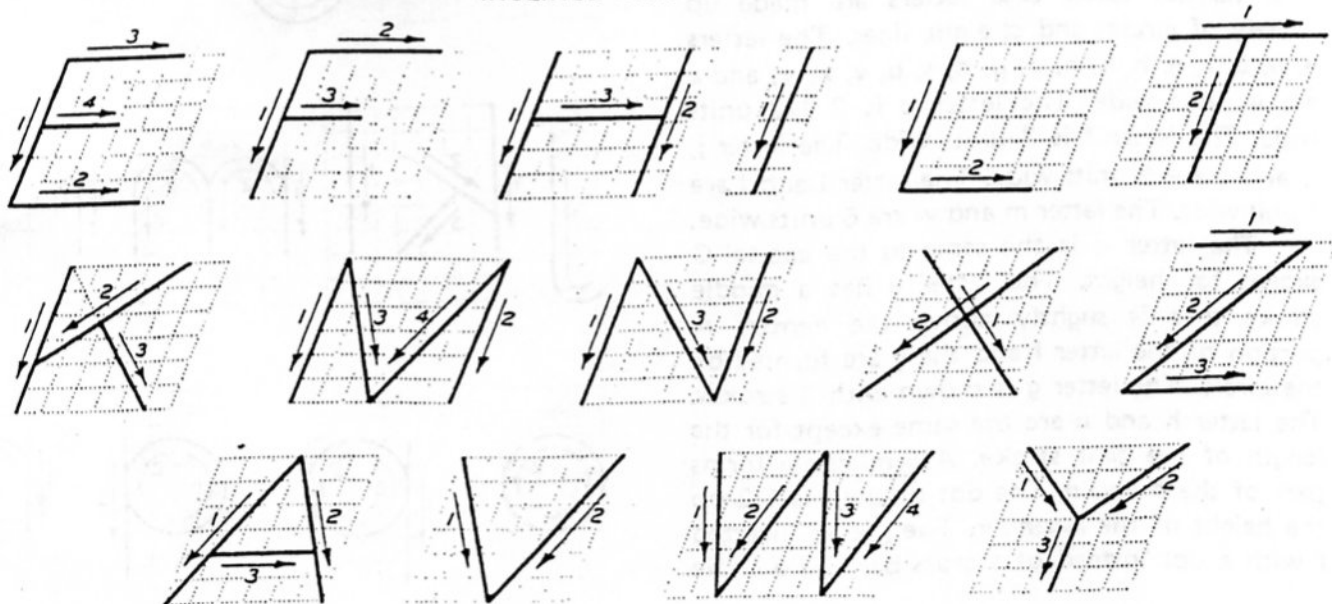
The Ames lettering instrument is a convenient time-saving instrument for drawing ruling horizontal and inclined guide lines. It is placed against a straight-edge blade of the T-square and a hard lead pencil is inserted into the desired group of selected holes which determine the height of the letters. A slight degree of pressure against the downward side of the hole will maintain sliding contact against the blade of the T-square. Uniformly spaced guide lines of any size up to 1½" high are easily achieved with this adjustable device. It consists of a clear acrylic plastic frame and a rotatable disc with indexed rim. Holes in the disc provide for five lettering

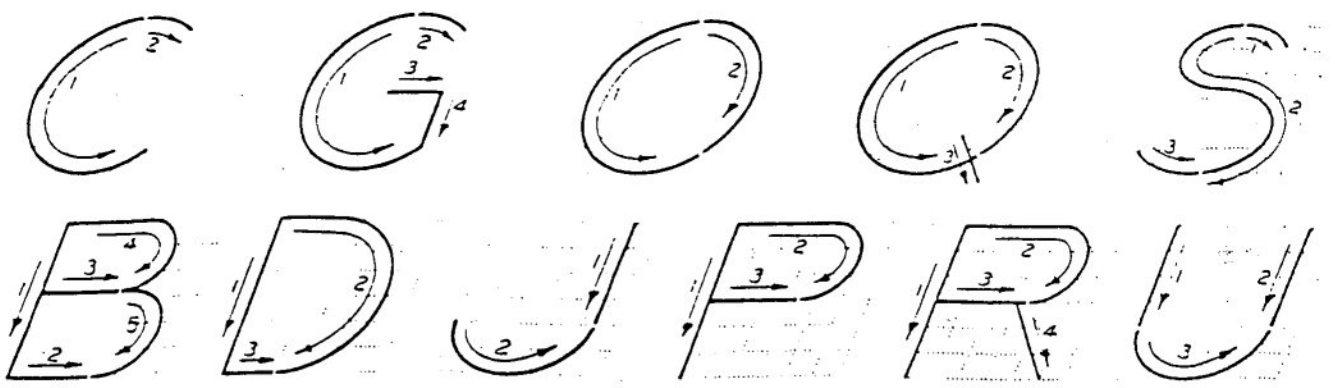
INCLINED CAPITAL LETTERS

For the inclined style of lettering, sloping guide lines are used. The letters should be compared with the sloping guide lines so that the inclination of all the letters will be uniform.

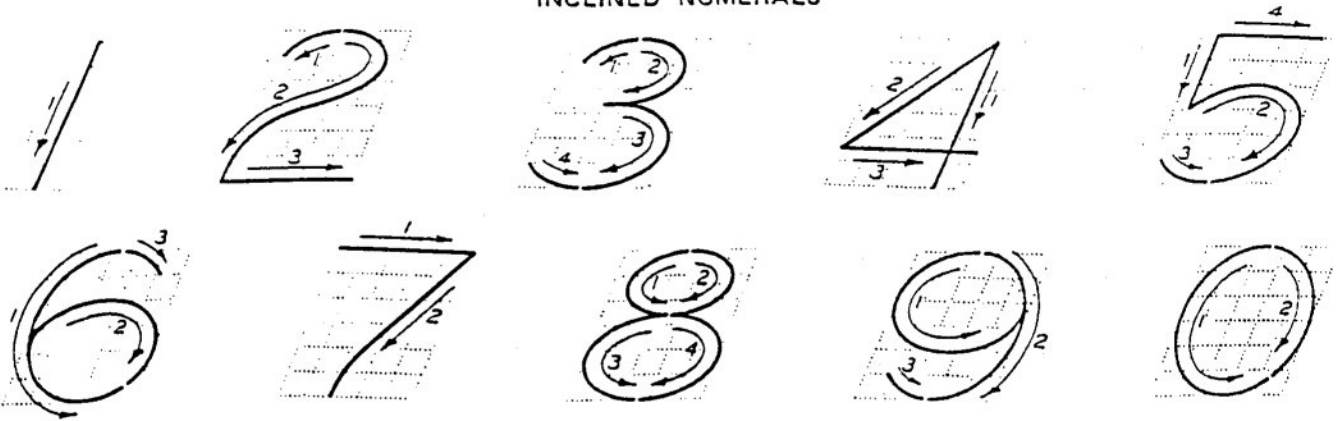
The angle for inclined guide lines is 68° or a proportion of 2 units of run to 5 units of rise. The shapes of the inclined letters can easily be learned by substituting a rhombus grid square.

INCLINED CAPITAL LETTERS

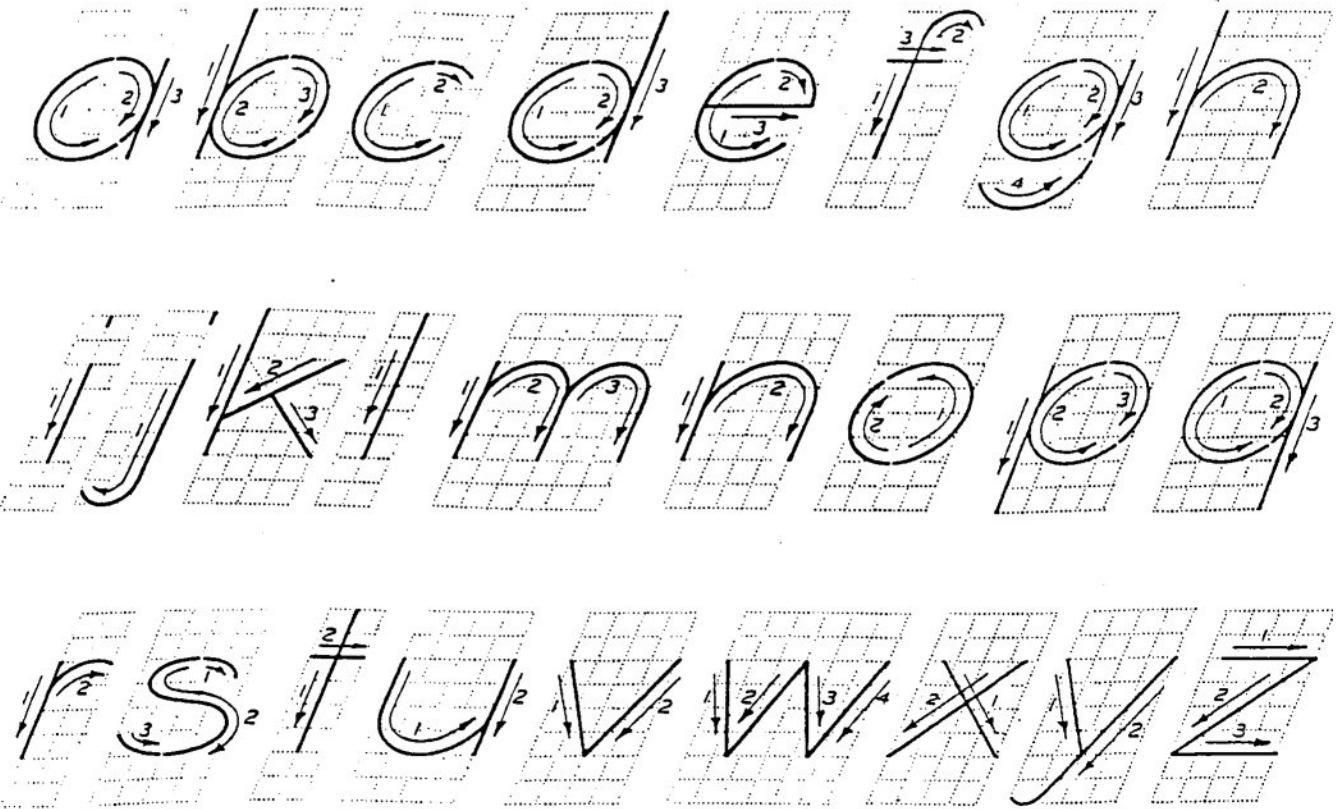




INCLINED NUMERALS



INCLINED LOWER CASE LETTERS



Lettering

The most important requirement for lettering as used on drawings is legibility. The second is ease and rapidity of execution. These two requirements are met in the single-stroke commercial gothic letter, now in almost universal use throughout the technical world. Preference seems to be divided between the vertical and the inclined styles. Approved specimens * of vertical and inclined letters are shown on this and the following pages and are in accordance with the American Standards Association's *American Drafting Standards Manual*.

VERTICAL LETTERS

TYPE 1

ABCDEFGHIJKLMN
OP
QRSTUVWXYZ &
1234567890 $\frac{1}{2}$ $\frac{3}{4}$ $\frac{5}{8}$

TITLES & DRAWING NUMBERS

TYPE 2

FOR SUB-TITLES OR MAIN TITLES
ON SMALL DRAWINGS

TYPE 3

ABCDEFGHIJKLMN
OPQRSTUVWXYZ &
1234567890 $\frac{1}{2}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{9}{32}$

FOR HEADINGS AND PROMINENT NOTES

TYPE 4

ABCDEFGHIJKLMN
OPQRSTUVWXYZ &
1234567890 $\frac{1}{2}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{23}{32}$

FOR BILLS OF MATERIAL, DIMENSIONS & GENERAL NOTES

TYPE 5

OPTIONAL TYPE SAME AS TYPE 4 BUT USING TYPE 3 FOR FIRST
LETTER OF PRINCIPAL WORDS. MAY BE USED FOR SUB-TITLES
AND NOTES ON THE BODY OF DRAWINGS.

TYPE 6

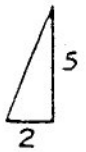
abcdefghijklmnopqrstu
vwxyz

* ASA Y14.2-1957

TYPE 1

ABCDEFGHIJKLMN O P

QRSTUVWXYZ &

1234567890 $\frac{1}{2}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{7}{16}$ 

TO BE USED FOR MAIN TITLES
& DRAWING NUMBERS

TYPE 2

ABCDEFGHIJKLMN O P Q R

STUVWXYZ &

1234567890 $\frac{13}{64}$ $\frac{5}{8}$ $\frac{1}{2}$

TO BE USED FOR SUB-TITLES

TYPE 3

ABCDEFGHIJKLMN O P Q R S T U V W X Y Z &

1234567890 $\frac{1}{2}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{7}{16}$

FOR HEADINGS AND PROMINENT NOTES

TYPE 4

ABCDEFGHIJKLMN O P Q R S T U V W X Y Z &

1234567890 $\frac{1}{2}$ $\frac{1}{4}$ $\frac{3}{8}$ $\frac{5}{16}$ $\frac{7}{32}$

FOR BILLS OF MATERIAL, DIMENSIONS & GENERAL NOTES

TYPE 5

OPTIONAL TYPE SAME AS TYPE 4 BUT USING TYPE 3 FOR FIRST
LETTER OF PRINCIPAL WORDS. MAY BE USED FOR SUB-TITLES &
NOTES ON THE BODY OF DRAWINGS.

TYPE 6

abcdefghijklmnopqrstuvwxy z

*Type 6 may be used in place of
Type 4 with capitals of Type 3,
for Bills of Material and Notes
on Body of Drawing.*

Draw vertical guide lines before starting to letter.

Handwriting practice grid for capital letters A, H, K, N, Z, V, Y, C, O, S, D, P, U. Each letter is shown with numbered arrows indicating stroke order and direction. The letters are placed on a grid with vertical guide lines.

Handwriting practice grid for capital letters M, X, A, W, G, Q, B, U, R, &. Each letter is shown with numbered arrows indicating stroke order and direction. The letters are placed on a grid with vertical guide lines.

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LAST NAME		INITIALS		CIVIL ENGINEERING GRAPHICS	
PROF.		VERTICAL CAPITAL LETTERS		SCALE DATE	PROBLEM 1-1

Draw incline guide lines before starting to letter.

a

b

c

d

e

f

g

h

i

j

k

l

m

n

o

p

q

r

s

t

u

v

w

x

y

z

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LAST NAME

INITIALS

CIVIL ENGINEERING GRAPHICS

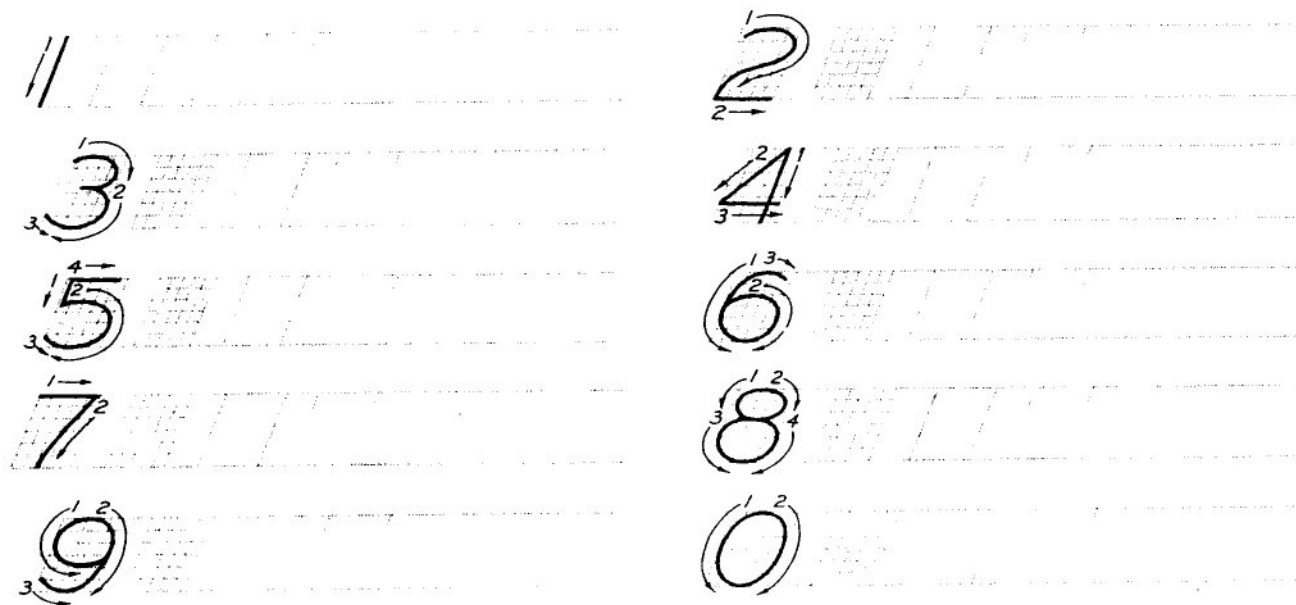
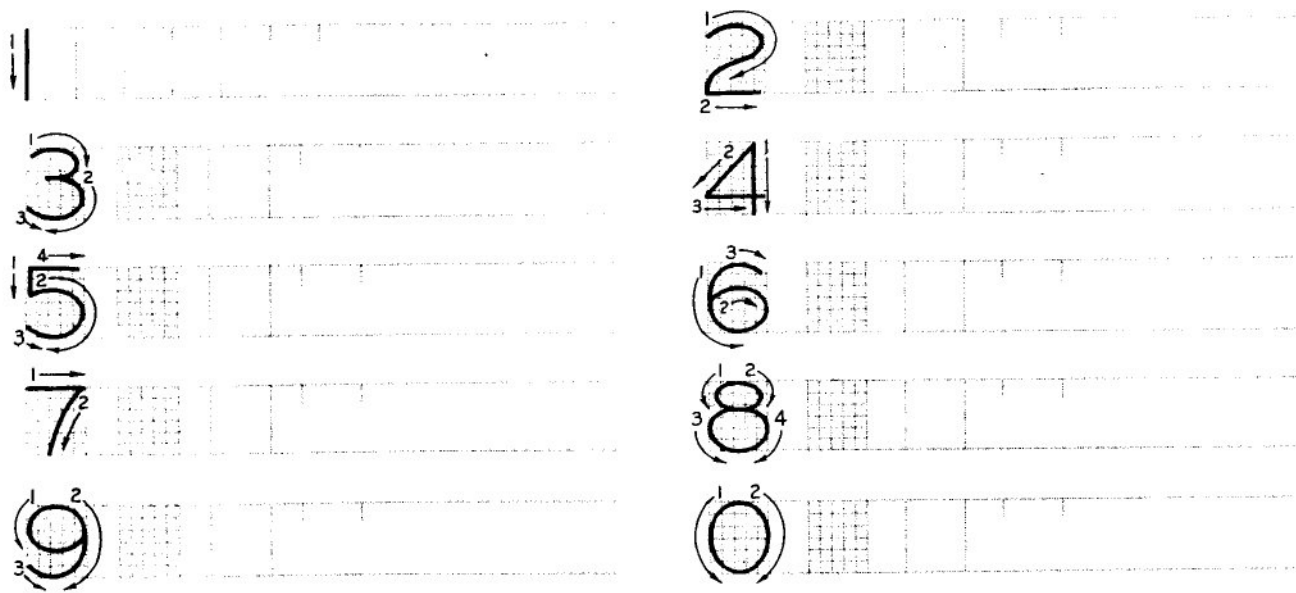
PROF.

INCLINED LOWER-CASE LETTERS

SCALE
DATE

PROBLEM
1-4

Draw vertical and incline guide lines before starting to letter.



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LAST NAME		INITIALS	CIVIL ENGINEERING GRAPHICS	
PROF.	VERTICAL AND INCLINED NUMERALS		SCALE DATE	PROBLEM 1-5