# *Civil Engineering Drawing –I*

## *CE 1100*

## *Lecture-01 (Introduction: Lettering, Numbering & Heading)*

## Drawing

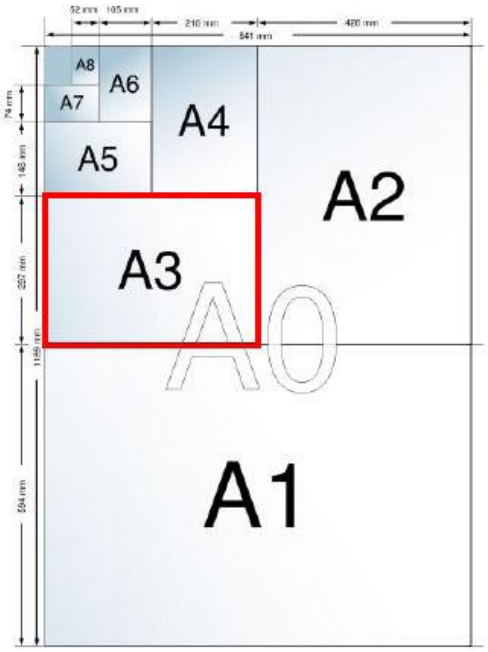
A drawing is a graphic representation of an object, or a part of it, and is the result of creative thought by an engineer or technician. When one person sketches a rough map in giving direction to another, this is graphic communication. Graphic communication involves using visual materials to relate ideas. Drawings, photographs, slides, transparencies, and sketches are all forms of graphic communication. Any medium that uses a graphic image to aid in conveying a message, instructions, or an idea is involved in graphic communication.

## Engineering drawing:

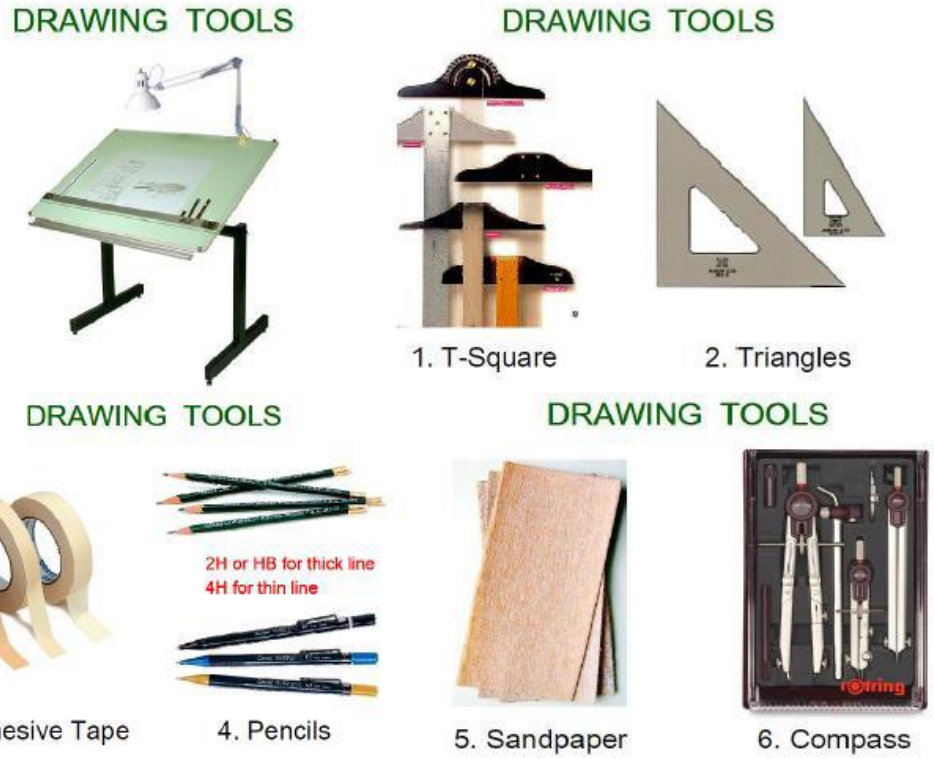
The engineering drawing, on the other hand, is not subtle, or abstract. It does not require an understanding of its creator, only an understanding of engineering drawings. An engineering drawing is a means of clearly and concisely communicating all of the information necessary to transform an idea or a concept in to reality. Therefore, an engineering drawing often contains more than just a graphic representation of its subject. It also contains dimensions, notes and specifications.

# Drawing Sheets

| A Series Formats (mm) | |
|---|---|
| **A0** | 841 × 1189 |
| **A1** | 594 × 841 |
| **A2** | 420 × 594 |
| **A3** | 297 × 420 |
| **A4** | 210 × 297 |
| **A5** | 148 × 210 |
| **A6** | 105 × 148 |
| **A7** | 74 × 105 |




## Drawing Tools:

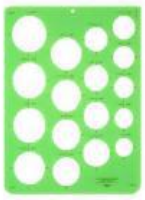


DRAWING TOOLS


7. Pencil Eraser

8. Erasing Shield

DRAWING TOOLS



9. Circle Template

10. Tissue paper

DRAWING TOOLS

11. Sharpener


12. Clean paper

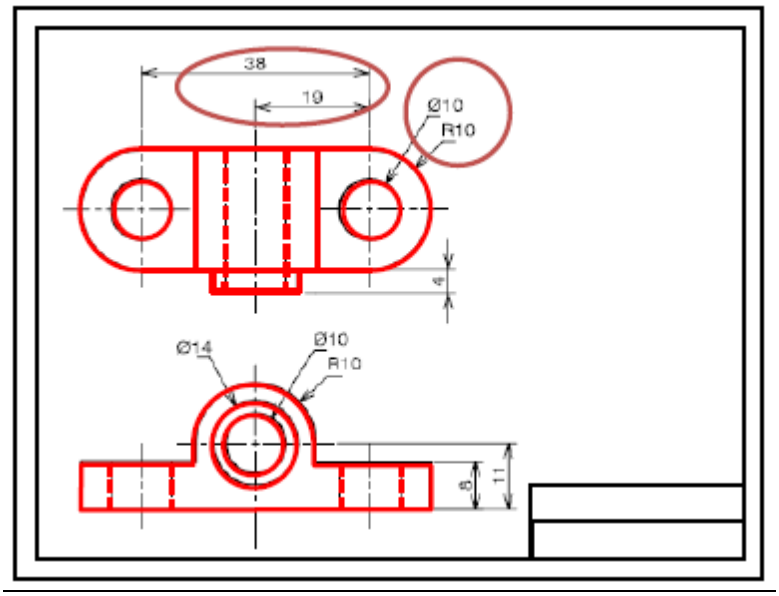
## *Course Contents:*

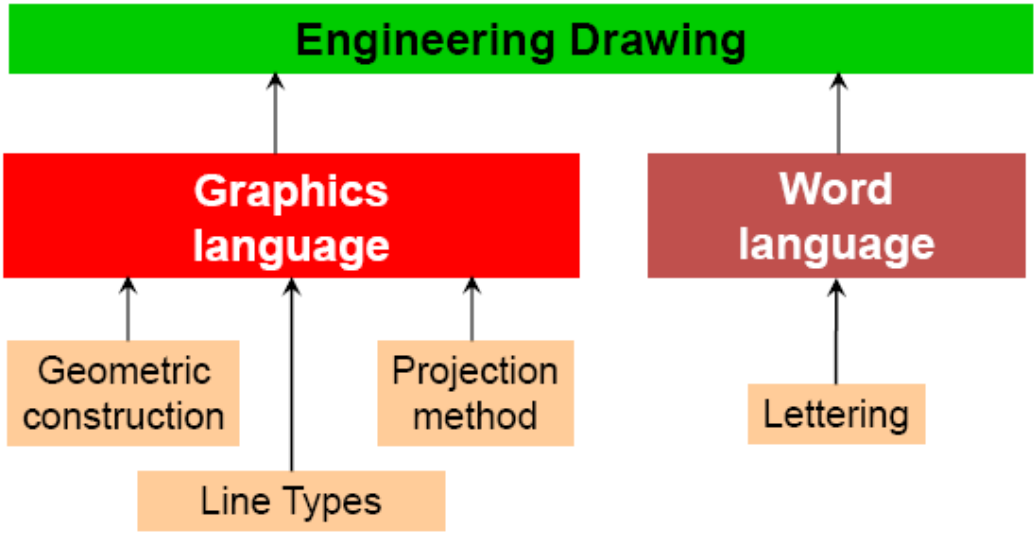
- **Introduction:** Lettering, Numbering and Heading
- **Plane Geometry:** pentagon, hexagon, octagon, ellipse, parabola, hyperbola.
- **Projection (Solid Geometry):** cube, triangular prism, square prism, pentagonal prism, hexagonal prism, cone and cylinder
- **Development:** cube, pyramid, cone, prism, isometric drawing**.**
- **Section and true shape:** cube, pyramid, cone, prism, interpolation of solids.

## Elements of Engineering Drawing

Engineering drawings are made up of *graphics language* and *word language*.

***Graphics language:*** Describe a shape (mainly).
***Word language***: Describe an exact size, location and specification of the object.




## Lettering in Engineering Drawing

Lettering is used to provide easy to read and understand information to supplement a drawing in the form of notes and annotations. Lettering is an essential element in both traditional drawing and Computer Aided Design (CAD) drawing. Thus, it must be written with:

***Legibility*** – shape & space between letters and words.

***Uniformity*** – size & line thickness.

## Types of Lettering

The two types of lettering are:

**1. Double Stroke Lettering:** In Double Stroke Lettering the line width is greater than that of
Single Stroke Lettering.
Double Stroke Lettering is further divided into:
*a) Double Stroke Vertical Gothic Lettering.*
*b) Double Stroke Inclined Gothic Lettering.*

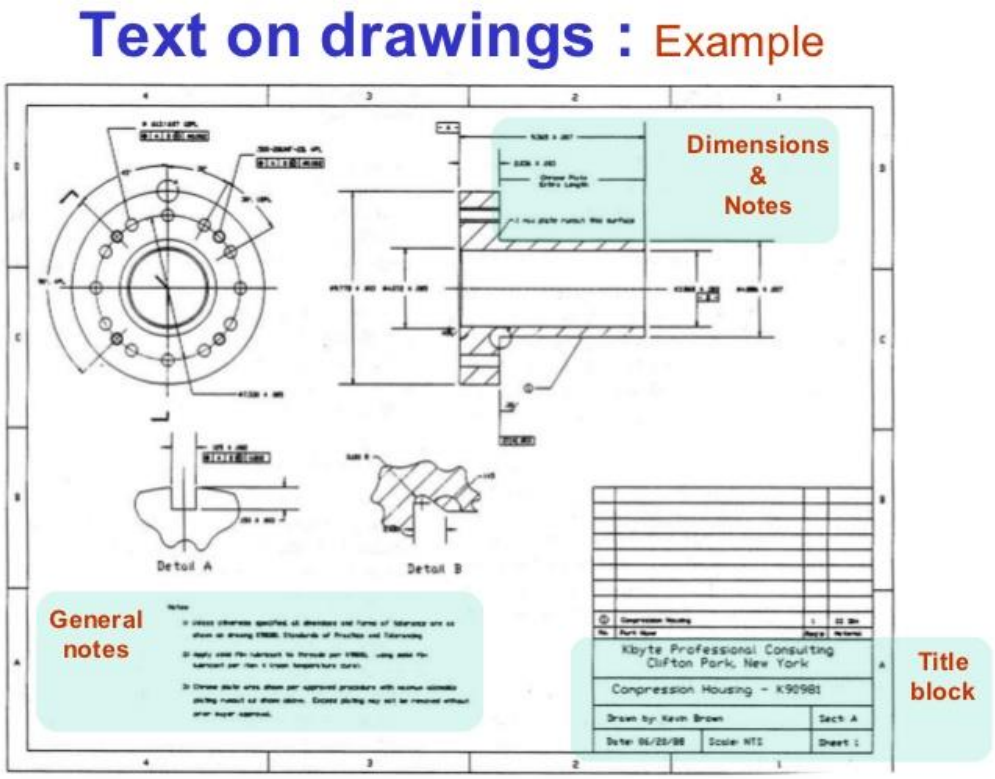
A stencil is mostly used when hand drawing double stroked letters.

**2. Single Stroke Lettering:** Thickness in single stroke lettering is obtained by a single stroke of pencil or ink pen. It is further divided into:
*(a) Single Stroke Vertical Gothic Lettering.*
*(b) Single Stroke Inclined Gothic Lettering.*

## Conventions for Lettering

- Use all **CAPITAL LETTERS.**
- Use ***even pressure*** to draw **precise, clean lines**.
- Use ***one stroke*** per line.
- **Horizontal Strokes** are drawn ***left to right***.
- **Vertical Strokes** are drawn ***downward***.
- **Curved strokes** are drawn ***top to bottom*** in one continuous stroke on each side.
- Use The ***Single-stroke, Gothic Style of Lettering***.
- Always ***Skip A Space*** between **Rows Of Letters**.
- Always Use ***Very Light Guide Lines***.
- **Fractions** Are Lettered ***Twice the Height Of Normal Letters***.
- **Fraction Bars** Are Always ***Drawn Horizontal***.
- Use a ***Medium Lead*** For ***Normal Lettering.***
- Use a ***Hard Lead*** For Drawing ***Guide Lines***.

## Placement of Text on Engineering Drawings




### Layout of a drawing sheet

Every drawing sheet is to follow a particular layout. As a standard practice sufficient margins are to be provided on all sides of the drawingsheet. The drawing sheet should have drawing space and title page. A typical layout of a drawing sheet is shown in the figure below:

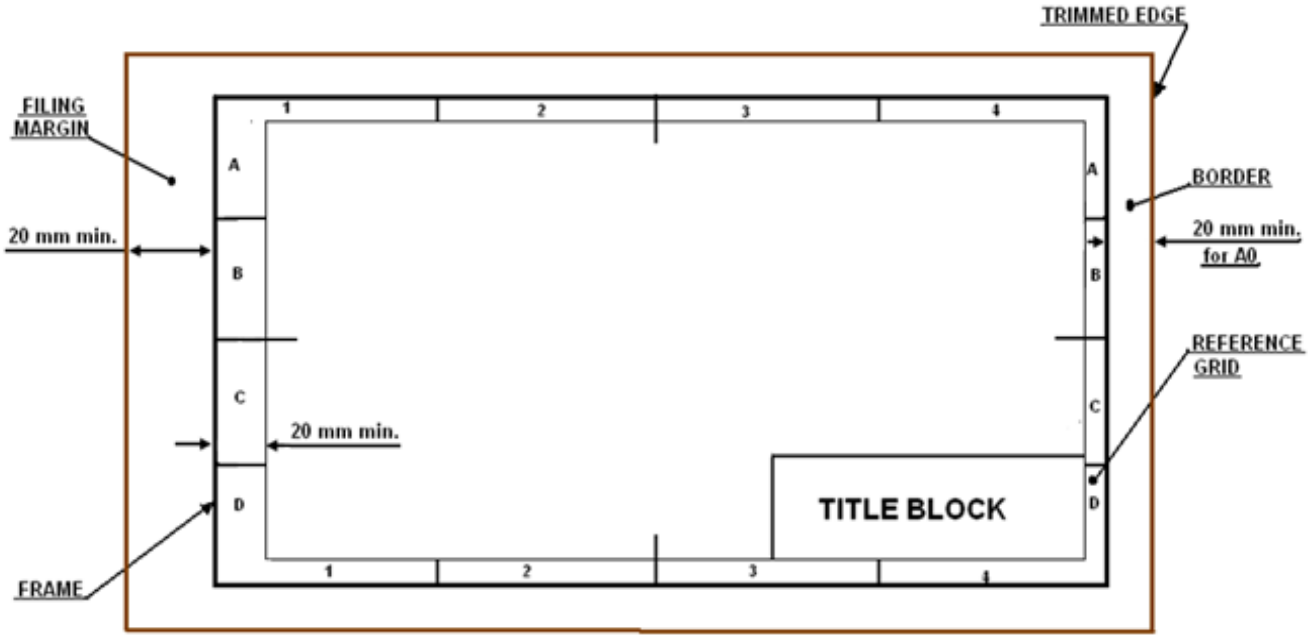
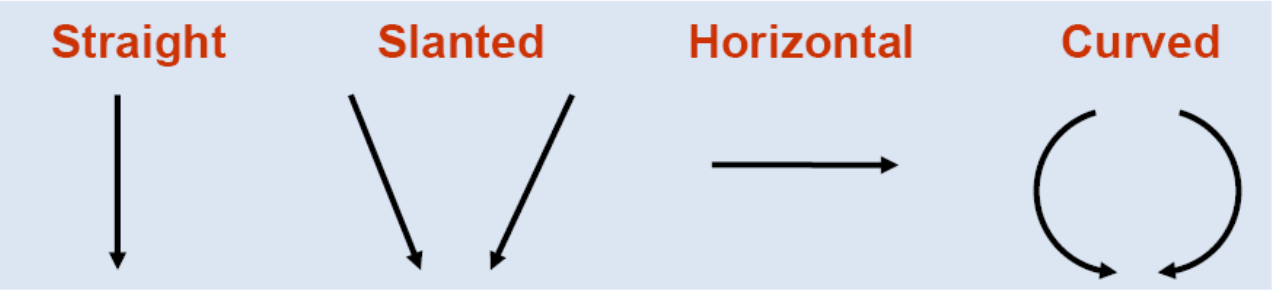
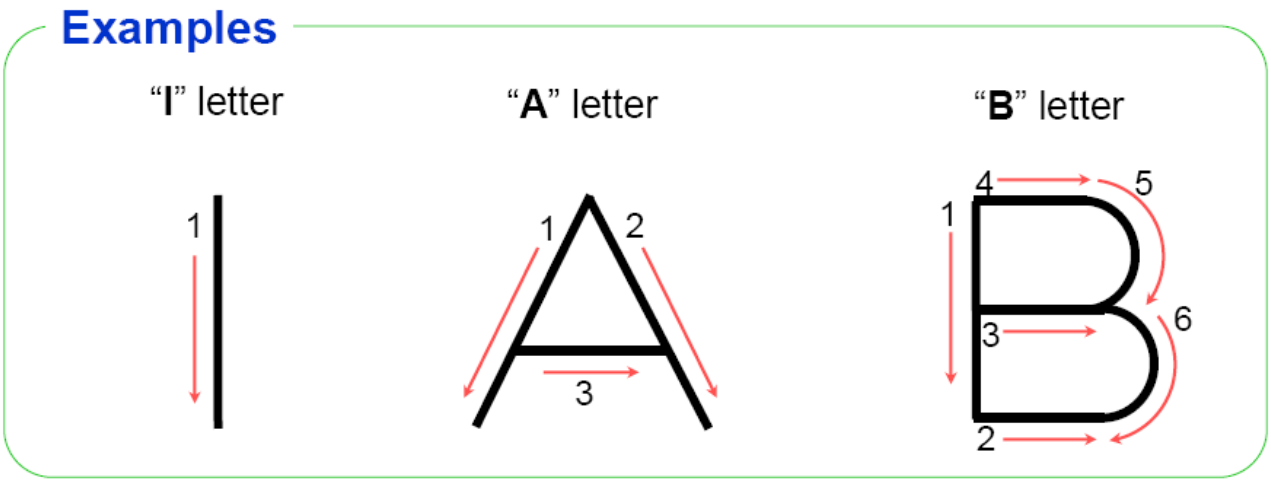



Figure 1. A typical layout of a drawing sheet.

## Basics of Single Stroking




## Spacing

Uniformity in spacing of letters is a matter of equalizing spaces by eye.

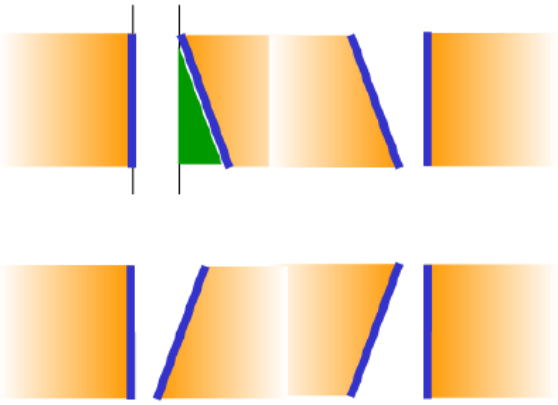
- The background area between letters, not the distance between them, should be approximately equal.
- Words are spaced well apart, but letters within words should be spaced closely.


**For either upper case or lower-case lettering, make the spaces between words approximately equal to a capital O.**

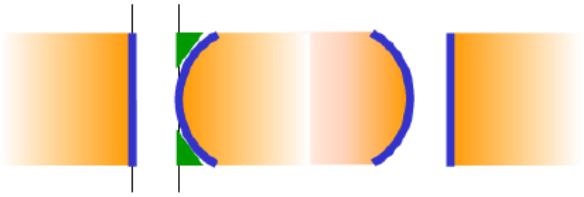

## Space between letters

1. Straight - Straight

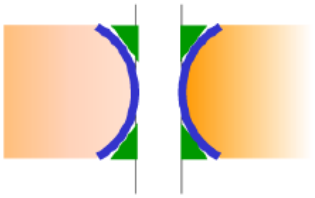
3. Straight - Slant

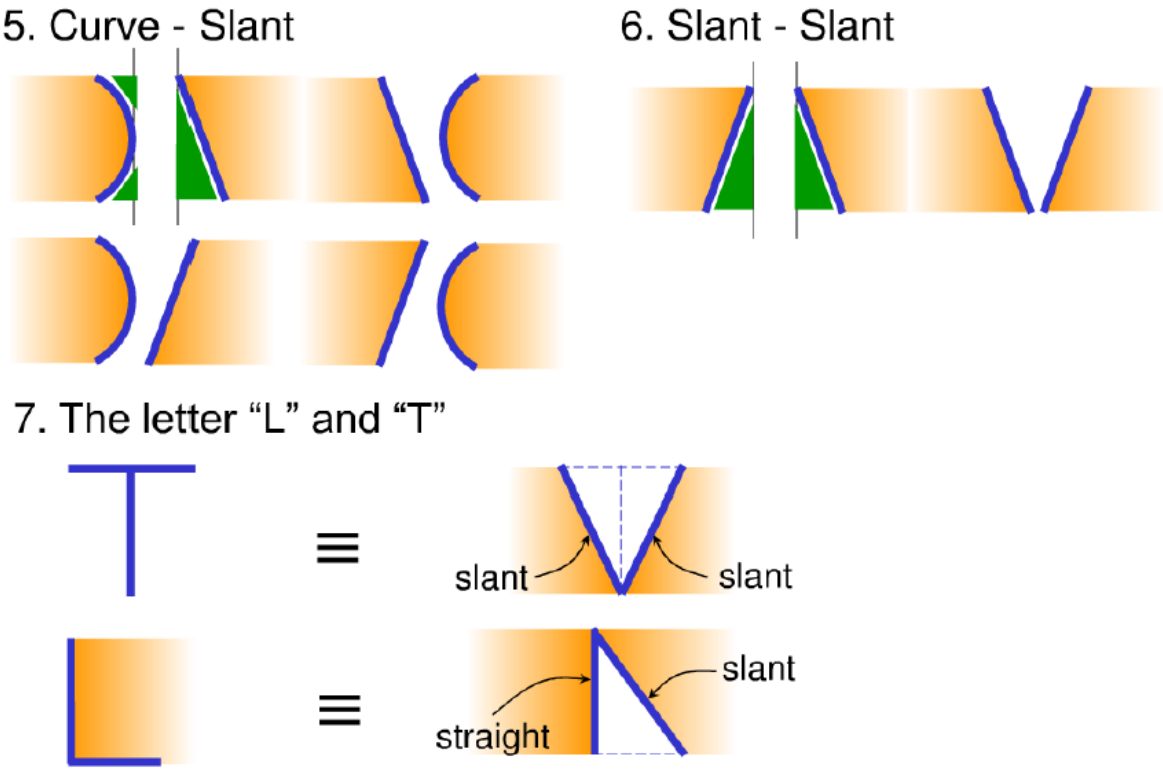


2. Straight - Curve



4. Curve - Curve






## Drawing scales

Scale is the ratio of the linear dimension of an element of an object shown in the drawing to the real linear dimension of the same element of the object.

Designation of a scale consists of the word "SCALE" followed by the indication of its ratio, as follows:

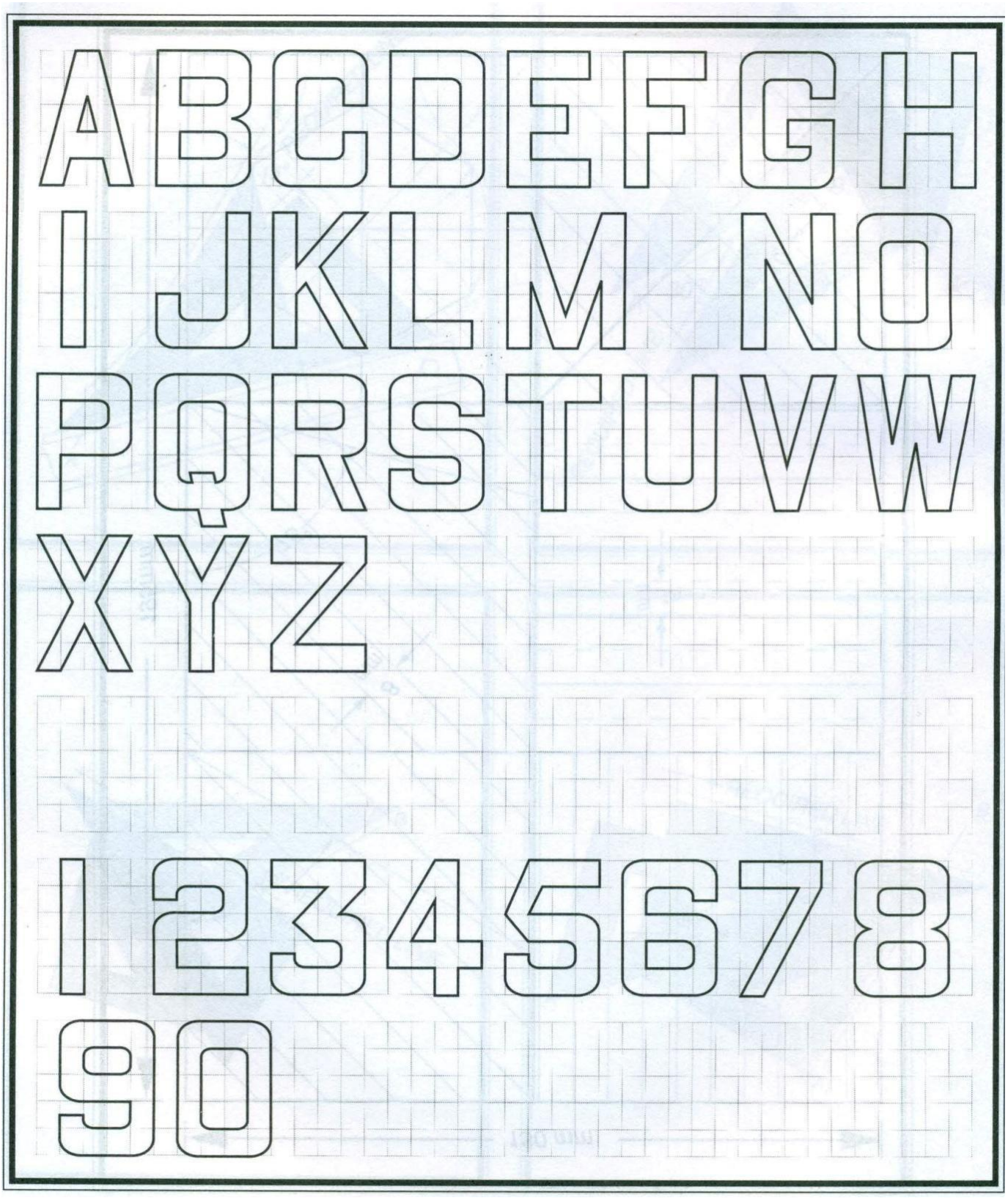
| | | |
|---|---|---|
| SCALE 1:1 | for full size | |
| SCALE X:1 | for *enlargement* scales | (X > 1) |
| SCALE 1:X | for *reduction* scales | (X > 1) |

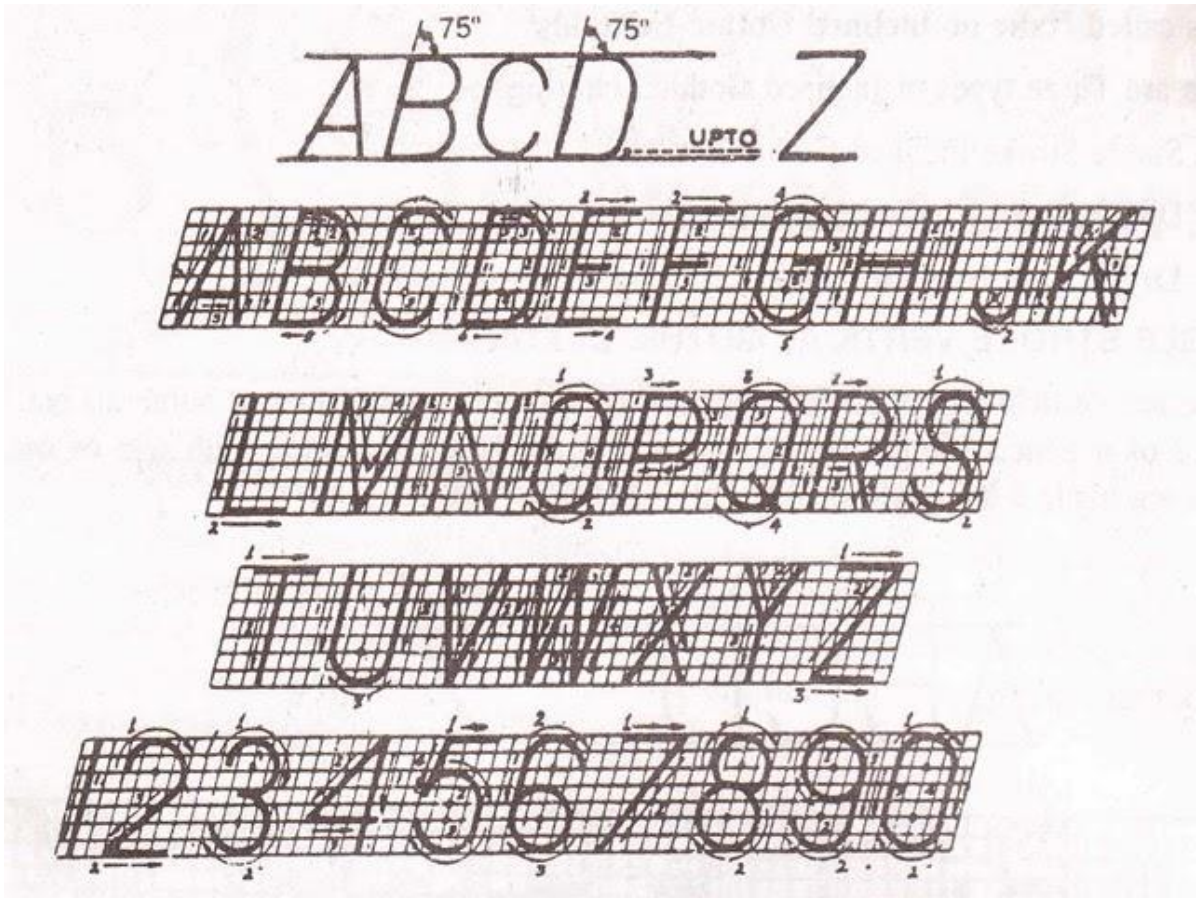
Dimension numbers shown in the drawing correspond to "true size" of the object and they are independent of the scale used in creating that drawing. **In Type B, height of the capital letter is divided into 10 equal parts. Type B is preferred for easy and fast execution, because of the division of height into 10 equal parts.**

**Capital letters:**

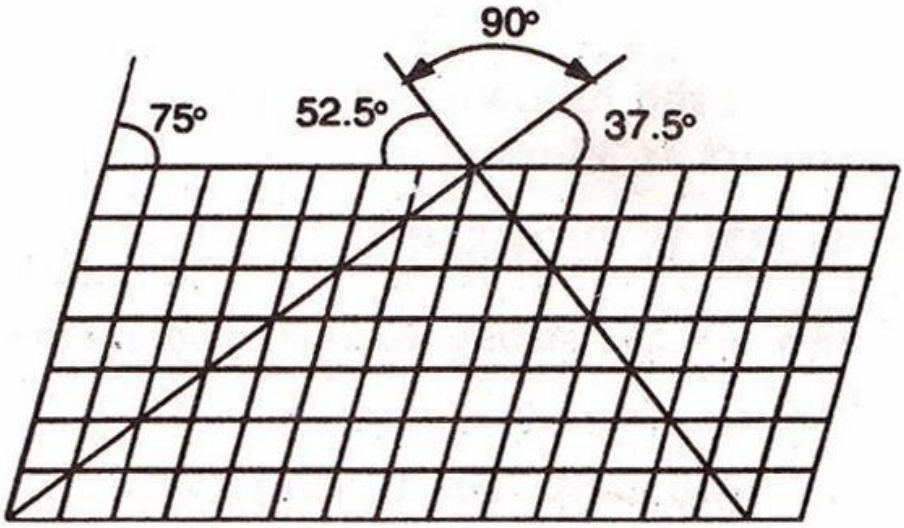
Ratio of height to width of most capital letter is approximately = 10:6. However, for M and W the ratio = 10:8. For I the ratio = 10:2

**Try with one-fourth (0.25) inches distance between the lines, in both the directions (X and Y axes)**

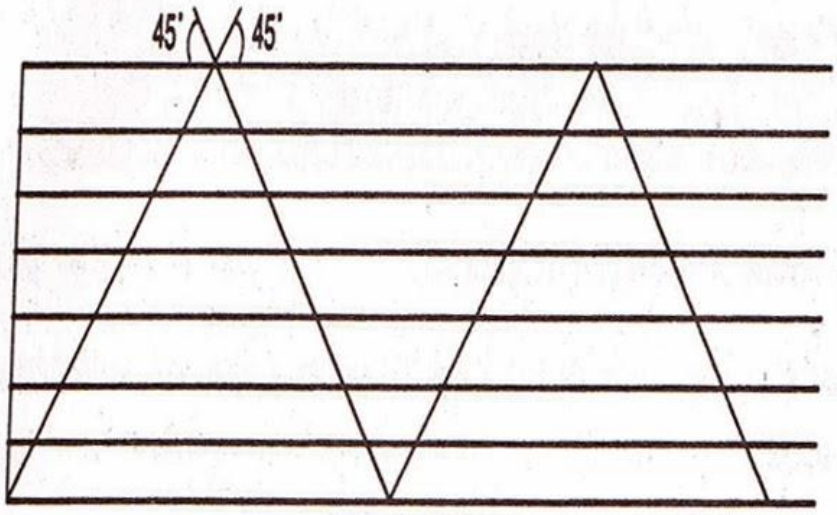


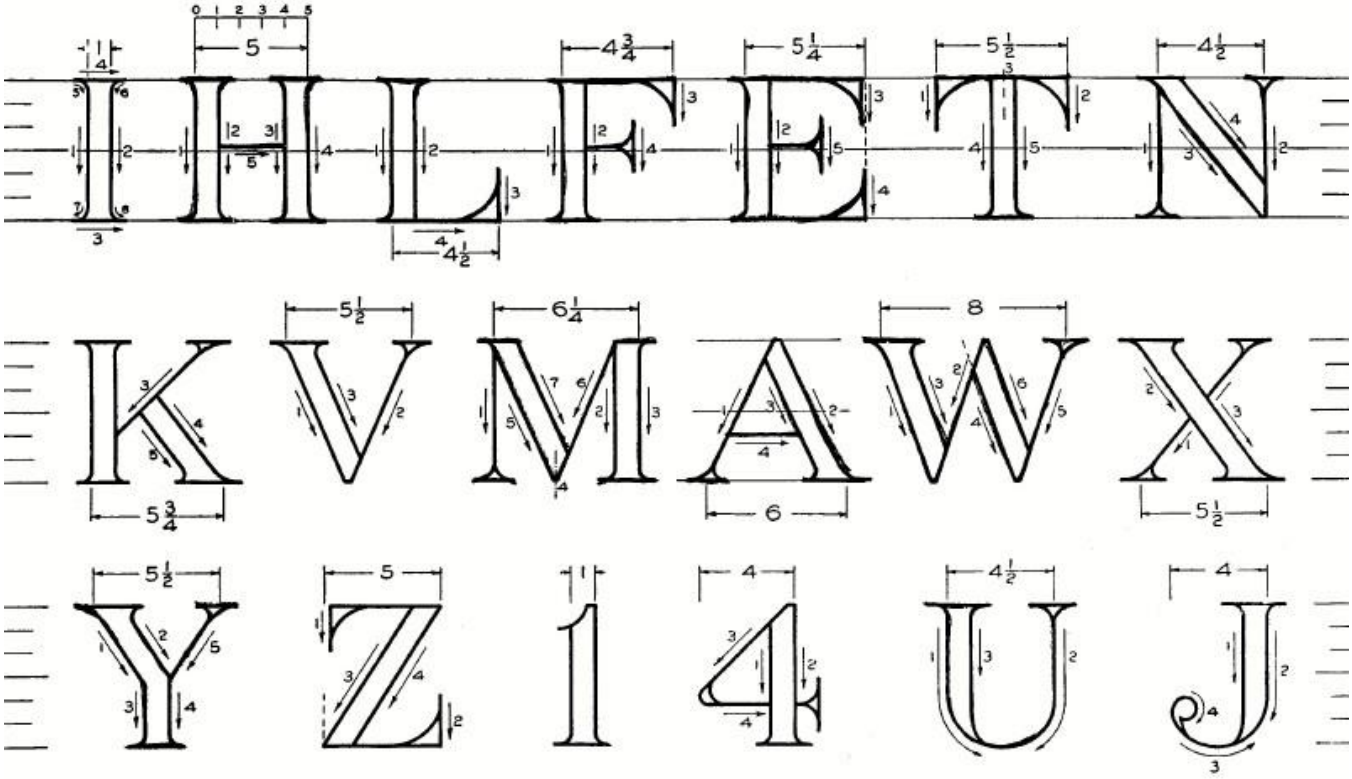

75°
75°
ABCD UPTO Z
ABCDEFGHIJK
LMNOPQRS
TUVWXYZ
1234567890

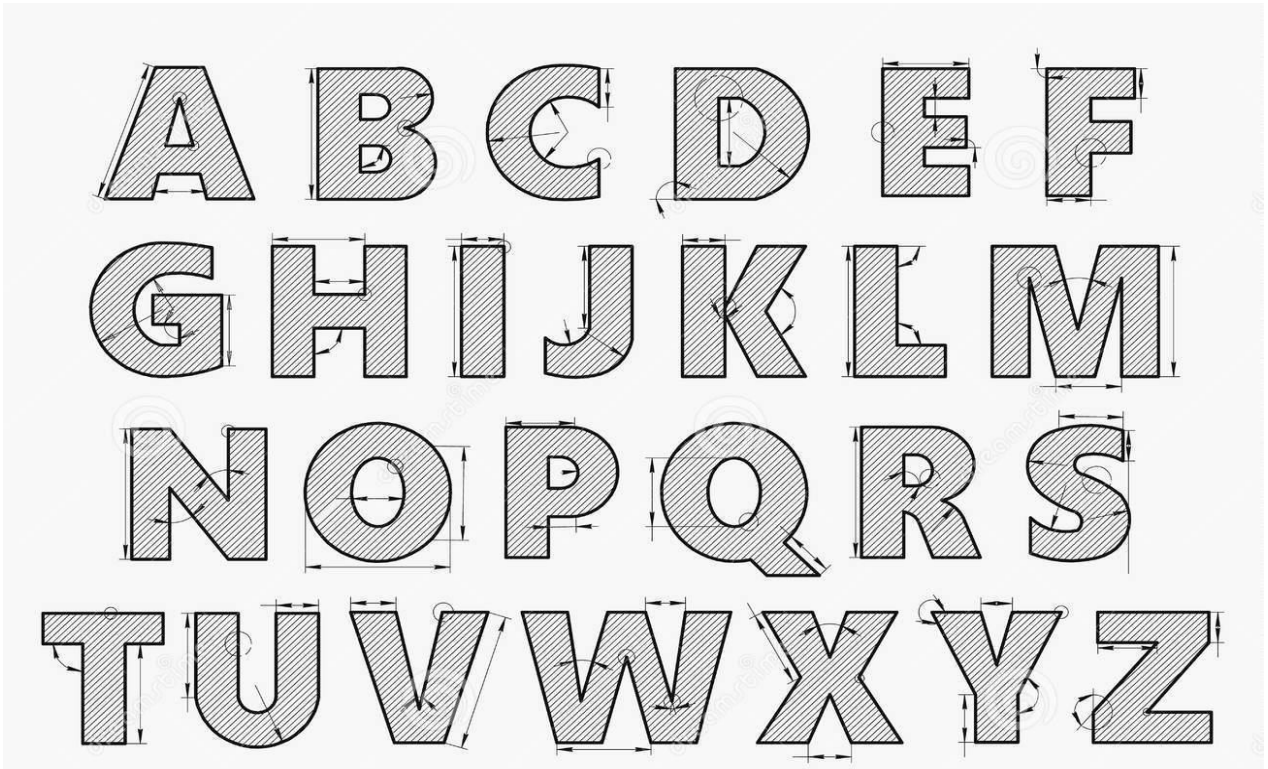

90°
ABCDEFGHIJ
90°
KLMNOPQR
STUVWXYZ
1234567890




## FOR INCLINED LETTERS







### 2.3.4 Size of Letters

- Size of Letters is measured by the height **h** of the CAPITAL letters as well as numerals.
- Standard heights for CAPITAL letters and numerals recommended by BIS are given below :

  **1.8, 2.5, 3.5, 5, 6, 10, 14** and **20 mm**

  **Note:** Size of the letters may be selected based upon the size of drawing.

**Guide Lines**

In order to obtain correct and uniform height of letters and numerals, guide lines are drawn, using 2H pencil with light pressure. HB grade conical end pencil is used for lettering.

### 2.3.5 Procedure for Lettering

1. Thin horizontal guide lines are drawn first at a distance '**h**' apart.
2. *Lettering Technique* : Horizontal lines of the letters are drawn from left to right. Vertical, inclined and curved lines are drawn from top to bottom.
3. After lettering has been completed, the guidelines are not erased.

### 2.3.6 Dimensioning of Type B Letters (Figs 2.5 and 2.6)

BIS denotes the characteristics of lettering as :

h (height of capital letters),

$c_1$ (height of lower-case letters),

$c_2$ (tail of lower-case letters),

$c_3$ (stem of lower-case letters),

a (spacing between characters),

$b_1$ & $b_2$ (spacing between baselines),

e (spacing between words) and

d (line thickness),

**Table 2.3** Lettering Proportions

| Recommended Size (height h) of Letters / Numerals | |
|---|---|
| Main Title | **5 mm, 7 mm, 10 mm** |
| Sub-Titles | **3.5 mm, 5 mm** |
| Dimensions, Notes, etc. | **2.5 mm, 3.5 mm, 5 mm** |

The following are some of the guide lines for lettering (Fig 2.9 & 2.10)

1. Drawing numbers, title block and letters denoting cutting planes, sections are written in 10 mm size.
2. Drawing title is written in 7 mm size.
3. Hatching, sub-titles, materials, dimensions, notes, etc., are written in 3.5 mm size.
4. Space between lines = ¾ h.
5. Space between words may be equal to the width of alphabet M or 3/5 h.

6. Space between letters should be approximately equal to 1/5 h. Poor spacing will affect the visual effect.
7. The spacing between two characters may be reduced by half if this gives a better visual effect, as for example LA, TV; over lapped in case of say LT, TA etc, and the space is increased for letters with adjoining stems.

**Lower-case Letters**

- Height of lower-case letters *with* stem / tail (b, d, f, g, h, j, k, l, p, q, t, y) = $c_2 = c_3 =$ **h**
- Ratio of height to width for lower-case letters *with* stem or tail = **10:5**
- Height of lower-case letters *without* stem or tail $c_1$ is approximately = **(7/10) h**
- Ratio of height to width for most lower-case letters *without* stem or tail = **7 : 5**
- However, for **m** and **w**, the ratio = **7 : 7**. For **I** and **l**, the ratio = **10:2**

## Numerals

- For numerals **0 to 9**, the ratio of height to width = **10 : 5**. For l, ratio = **10 : 2**

## Spacing

- Spacing between characters = **a = (2/10)h**
- Spacing between words = **e = (6/10)h**