

University of Gaziantep
Mechanical Engineering Department



Engineering Drawing-I

Lecture 1

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What will you learn in this course?

You will learn - How industry communicates technical information.

- **Visualization** - the ability to mentally control visual information.
- **Graphics theory** - geometry and projection techniques.
- **Standards** - set of rules that govern how parts are made and technical drawings are represented.
- **Conventions** - commonly accepted practices and methods used for technical drawings.
- **Tools** - devices used to create technical drawings and models.
- **Applications** - the various uses for technical drawings.

Engineering drawing is completely different from artistic drawing, which are used to express aesthetic, philosophical, and abstract ideas.

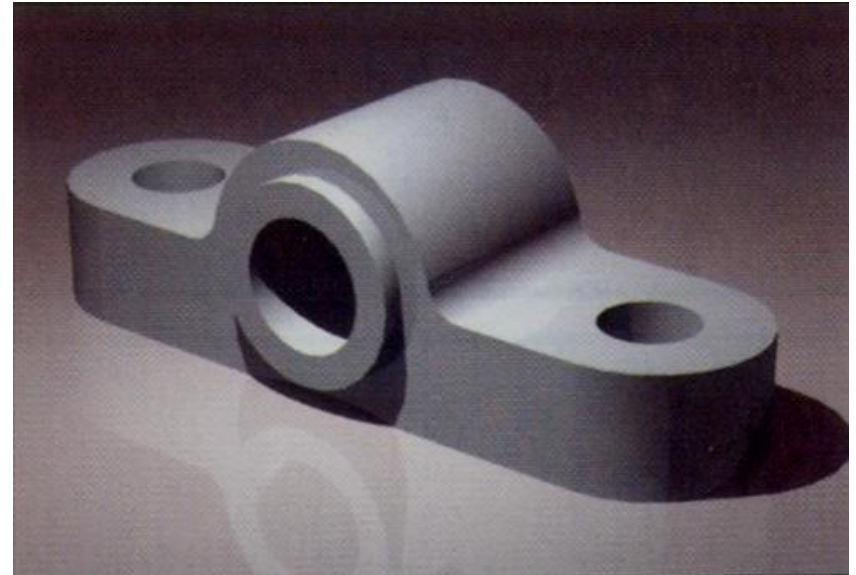


GRAPHICS LANGUAGE

- It is formal and precise way of communicating information about the shape, size, features and precision of physical objects.
- A universal way of language of engineering used in the design process for solving problems, quickly and accurately visualizing objects, and conducting analysis.
- A graphical representation of objects and structures.
- It can be done by using freehand, mechanical, or computer aided methods.

Effectiveness of Graphics Language

1. Try to write a description of this object.
 2. Test your written description by having someone attempt to make a sketch from your description.
-



You can easily understand that ...

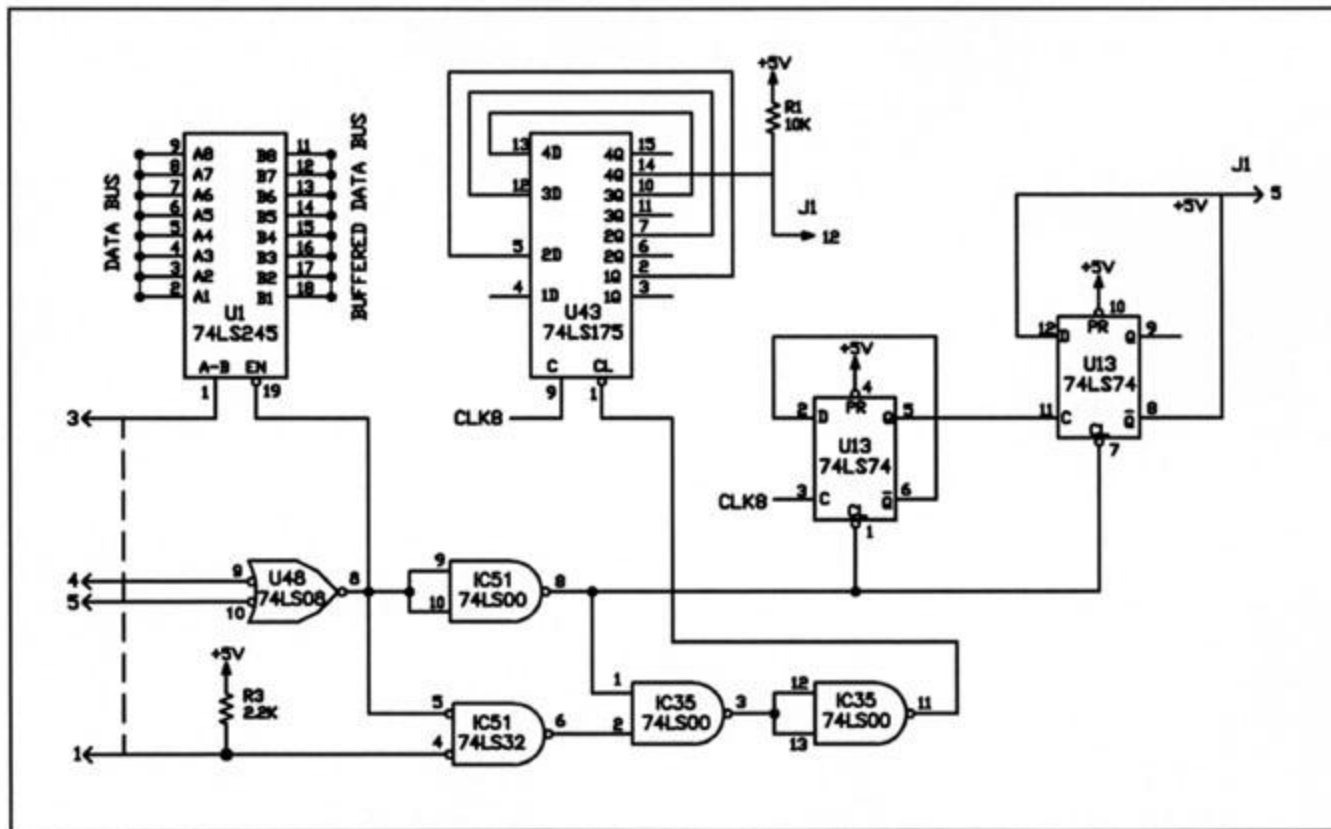
The word languages are inadequate for describing the **size**, **shape** and **features** completely as well as concisely.



Difficult to describe the details of the machine



**Chemical
reactor**



Electrical
circuit



**Impossible to
describe the details
of the building**

Drawing is important for all branches of engineering.

Composition of Graphic Language

Graphic language in “**engineering application**” use **lines** to represent the **surfaces**, **edges** and **contours** of objects.

- The language is known as “**drawing**” or “**drafting**” .
- A drawing can be done using **freehand**, **instruments** or **computer** methods.

Elements of Engineering Drawing

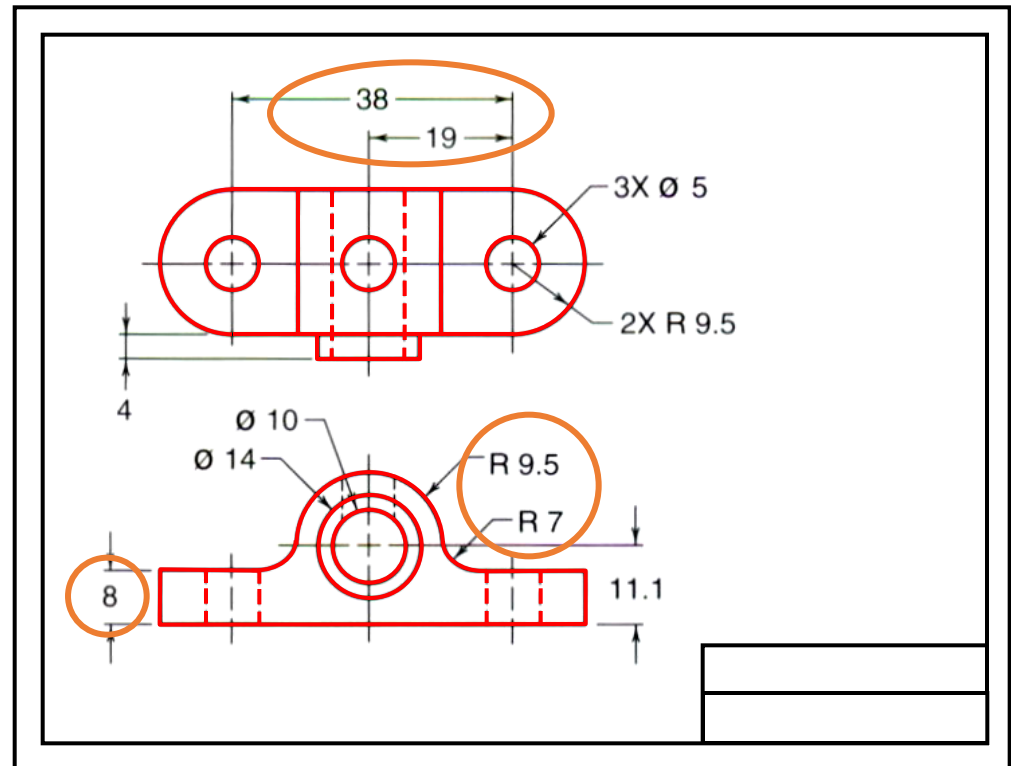
Engineering drawing are made up of **graphics language** and **word language**.

Graphics language

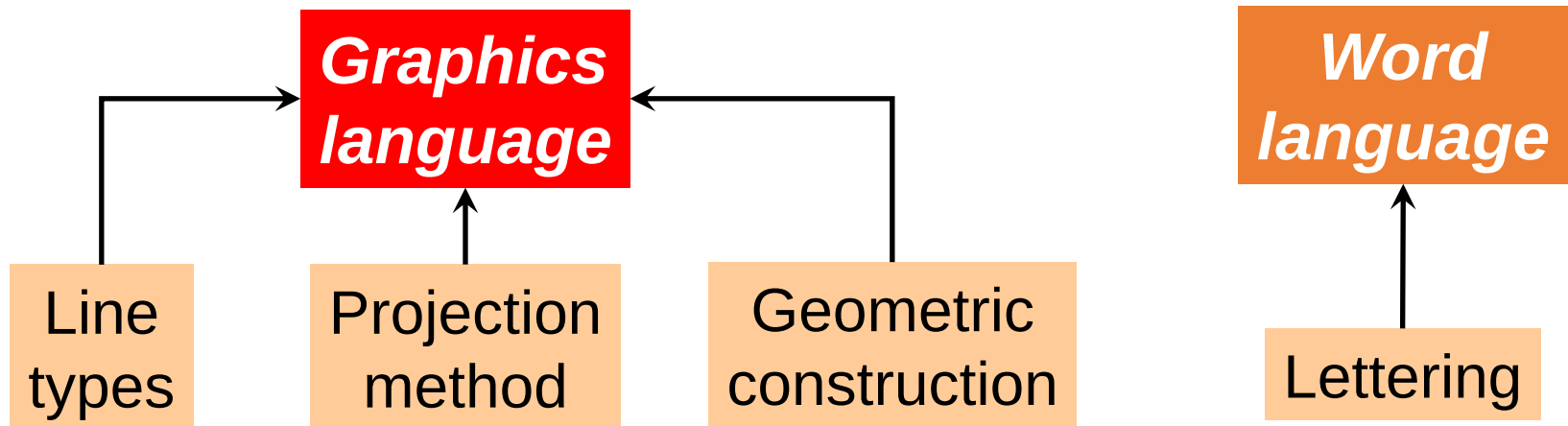
Describe a shape (mainly).

Word language

Describe size, location and specification of the object.



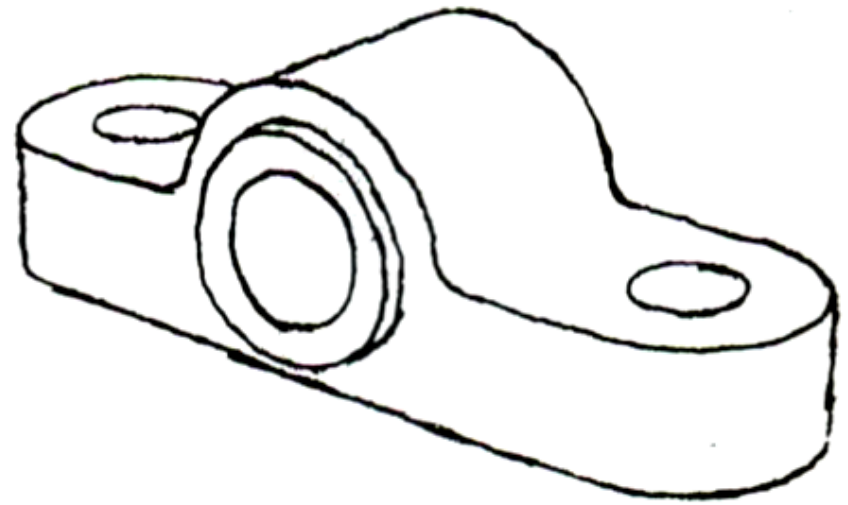
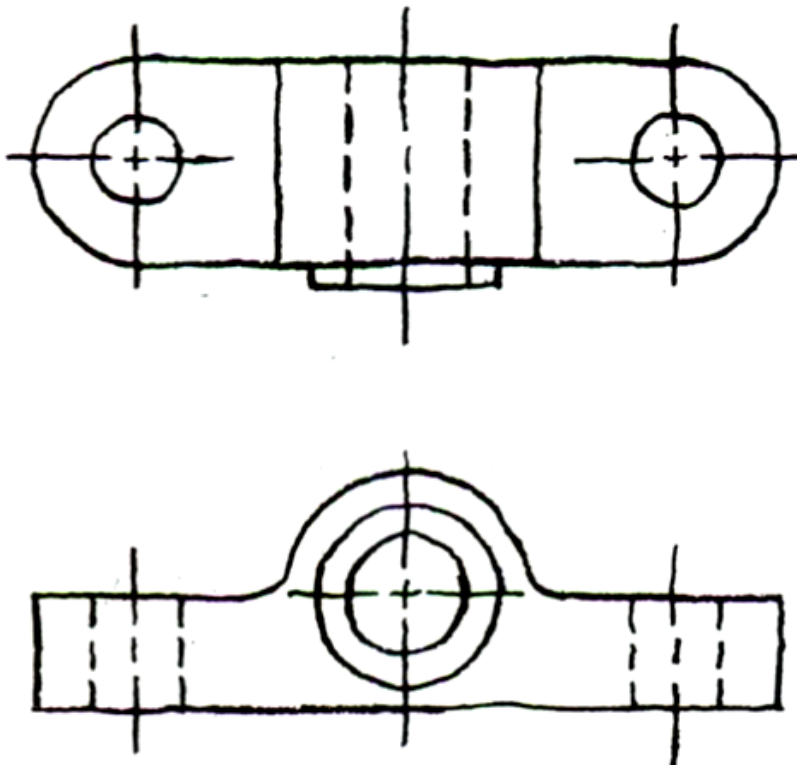
Basic Knowledge for Drafting



Freehand drawing

The lines are sketched without using instruments other than pencils and erasers.

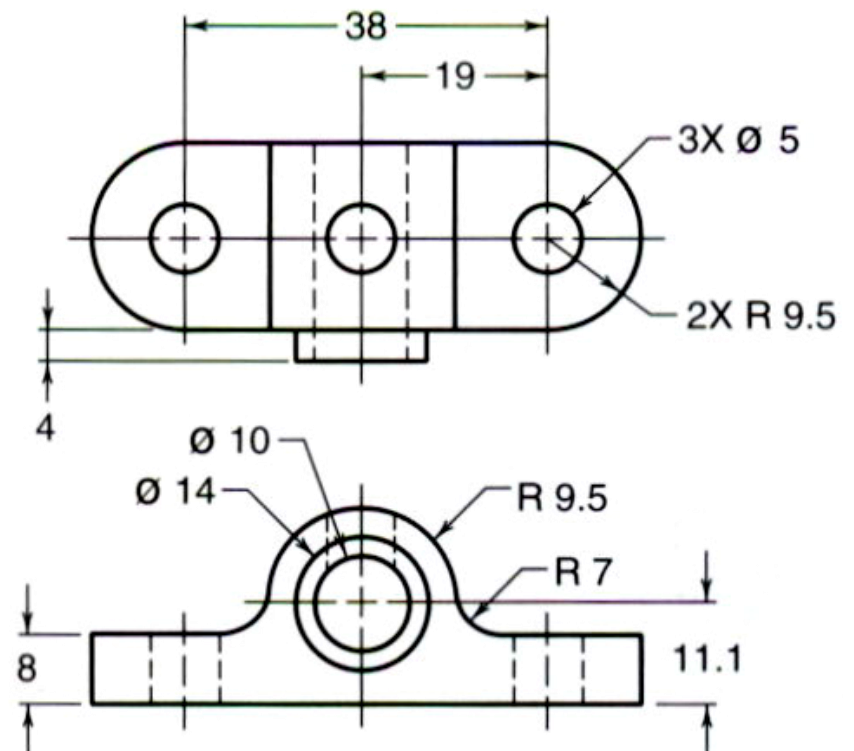
Example



Instrument drawing

Instruments are used to draw straight lines, circles, and curves concisely and accurately. Thus, the drawings are usually made to scale.

Example



Computer drawing

The drawings are usually made by commercial software such as AutoCAD, solid works etc.

Example



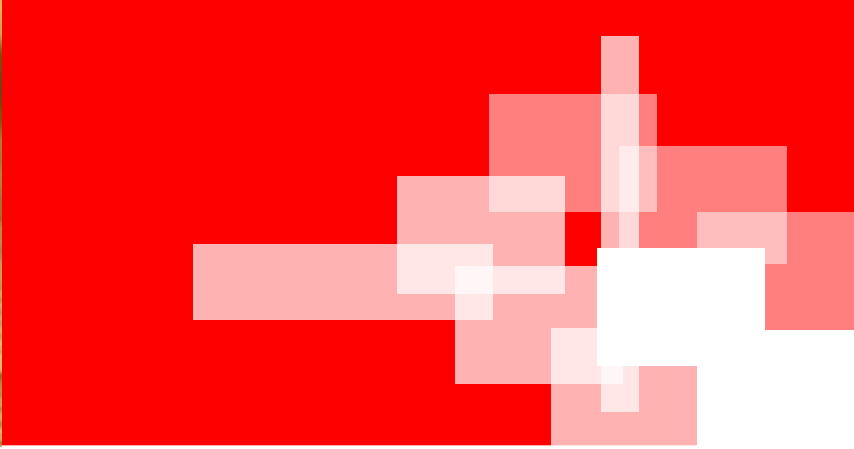
Why we go for manual drawing?

Computer cannot replace the drafting board and equipment as a learning tool.

Once you have learned the basics of mathematics, now after class 12, you are allowed the use of calculator and computer.

If basic fundamentals are clear, better use can be made of the power of the software.

To be an expert in technical drawing, this first course on Engineering (manual) Drawing is the first step.



Drawing Standard



Introduction

Standards are set of rules that govern how technical drawings are represented.

- Drawing standards are used so that drawings **convey the same meaning to everyone** who reads them.

Standard Code

Country	Code	Full name
USA	ANSI	American National Standard Institute
Japan	JIS	Japanese Industrial Standard
UK	BS	British Standard
Australia	AS	Australian Standard
Germany	DIN	Deutsches Institut für Normung
	ISO	International Standards Organization

Drawing Sheet

Trimmed paper of
a size A0 ~ A4.

Standard sheet size
(JIS)

A4 210 x 297

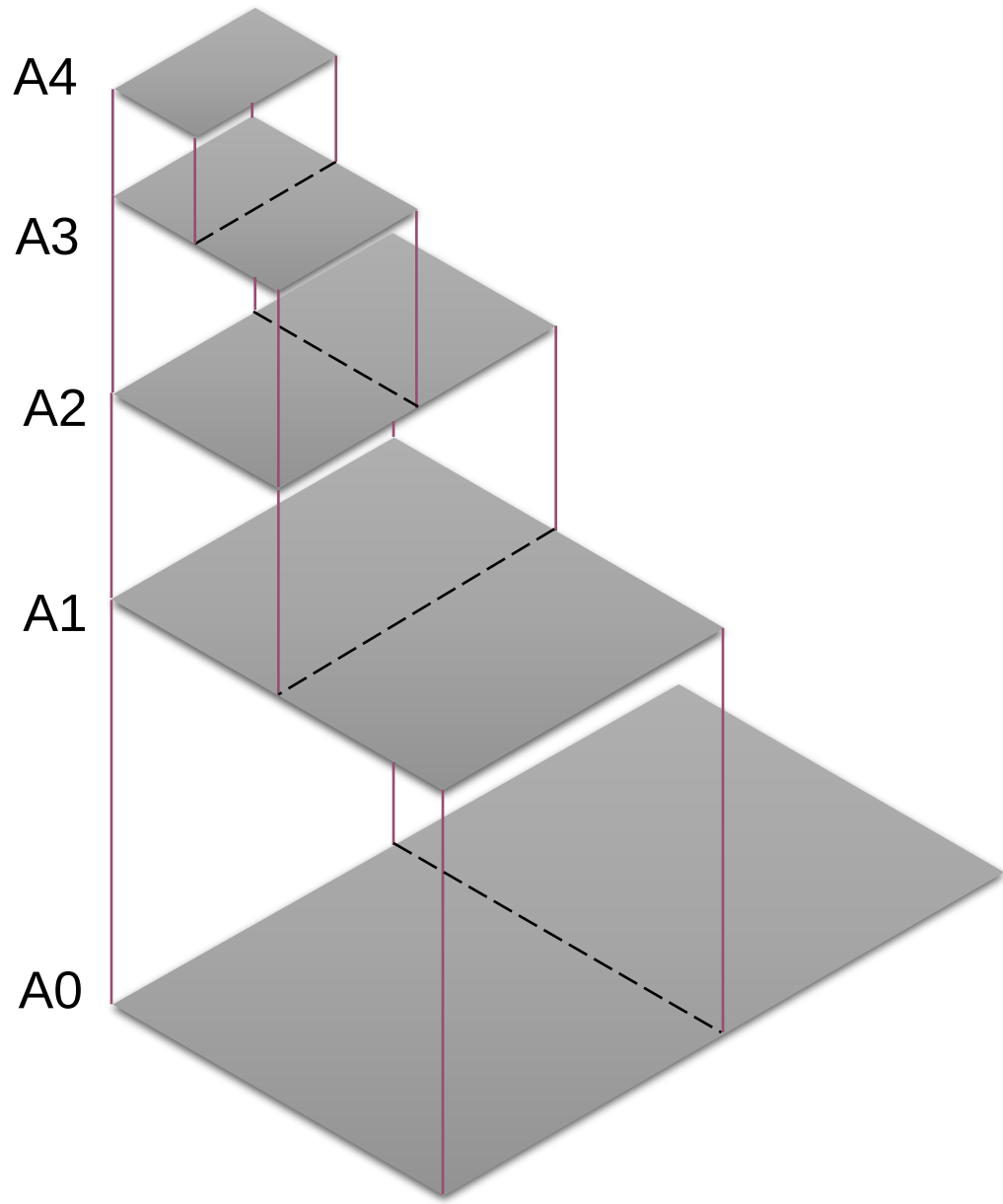
A3 297 x 420

A2 420 x 594

A1 594 x 841

A0 841 x 1189

(Dimensions in millimeters)



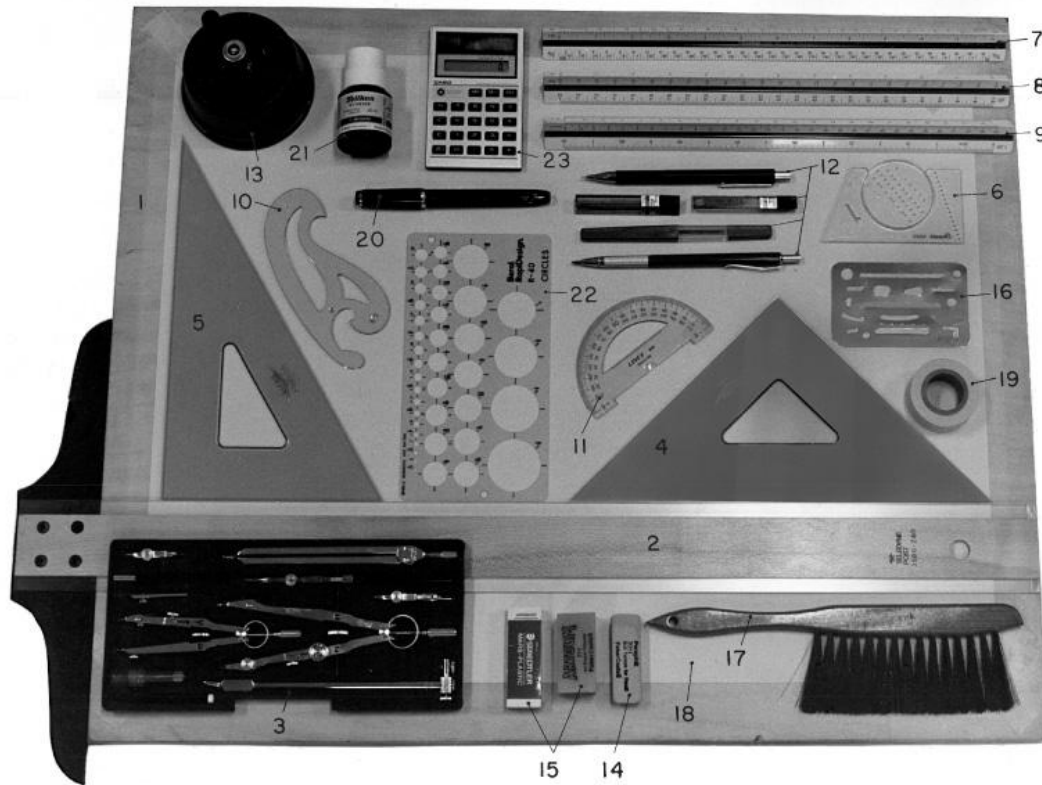
Drawing Scales

Designation of a scale consists of the word “SCALE” followed by the indication of its ratio, as follow

SCALE 1:1 for full size

SCALE X:1 for *enlargement* scales

SCALE 1:X for *reduction* scales



Traditional Drawing Tools

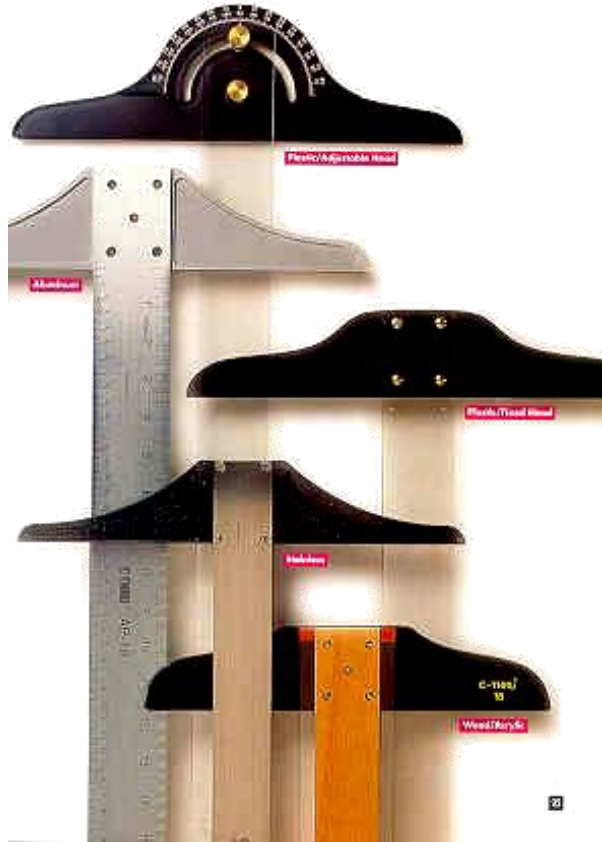
DRAWING TOOLS

The drawing board is a platform for engineering drawing, on which the drawing paper is placed and by means of the instruments drawing is made. The drawing surface may be the tabletop itself or a separate board. The left side edge of the board is called the “working edge” (for the right-handed).

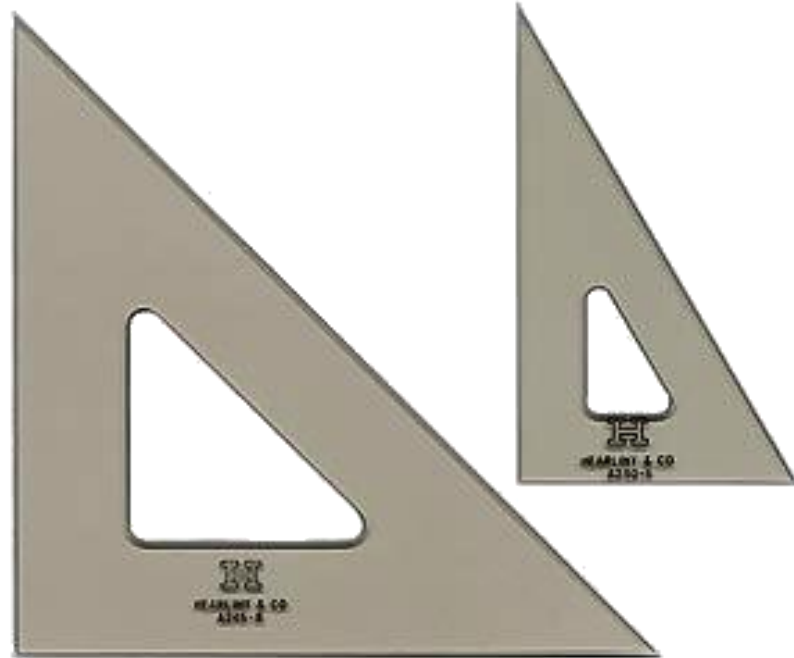


DRAWING TOOLS

T square is an instrument used to draw horizontal lines also guides the triangles when drawing vertical and inclined lines. It can have a fixed or a movable head



1. T-Square



2. Triangles

45° and 30°-60° triangles are used to draw vertical and inclined lines.

DRAWING TOOLS



3. Adhesive Tape



H or HB for thick line
2H for thin line



4. Pencils

DRAWING TOOLS



5. Sandpaper

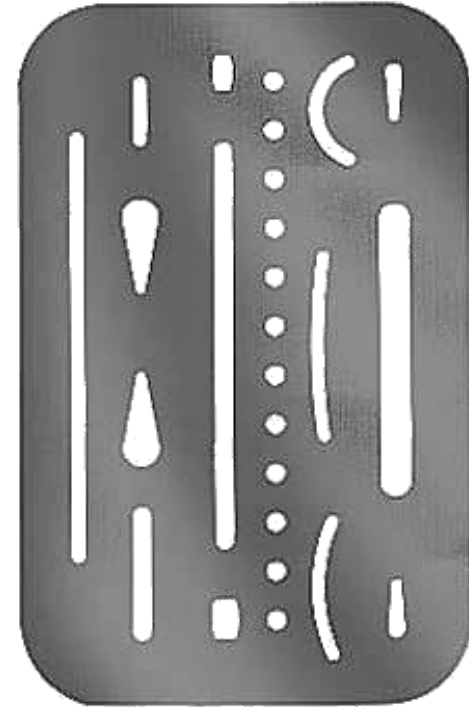


6. Compass

DRAWING TOOLS

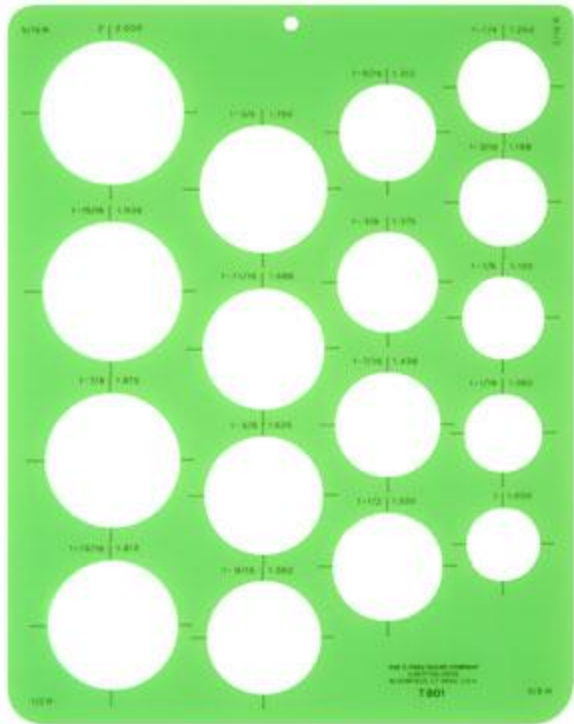


7. Pencil Eraser



8. Erasing Shield

DRAWING TOOLS



9. Circle Template

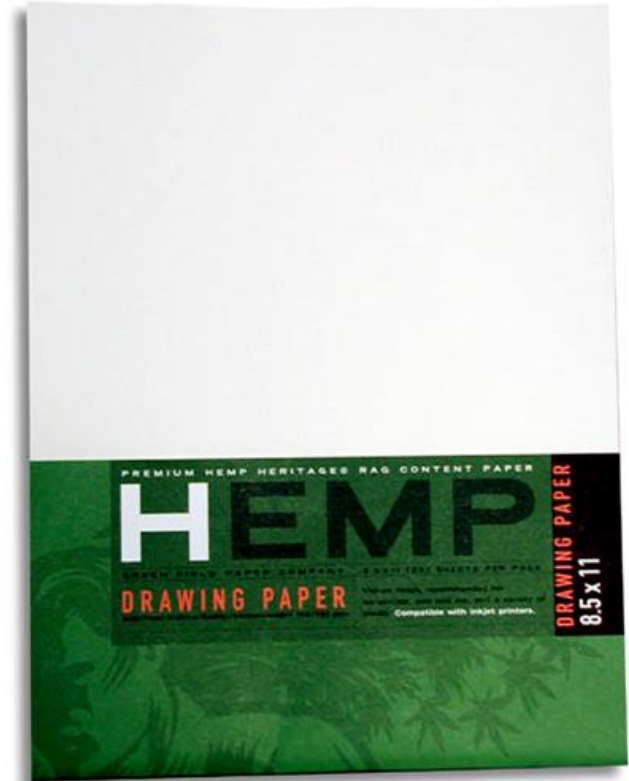


10. Tissue paper

DRAWING TOOLS



11. Sharpener



12. Clean paper

ABCDEFGHIJKLMNOPQRSTUVWXYZ

UVWXYZABCDEFGHIJKLM

NOPQRSTUVWXYZABCDEF

Lettering

ABCDEFGHIJKLMNOPQRSTUVWXYZ

UVWXYZABCDEFGHIJKLM

NOPQRSTUVWXYZABCDEF

Text on Drawings

Text on engineering drawing is used :

- To communicate non-graphic information.
- As a substitute for graphic information, in those instance where text can communicate the needed information more clearly and quickly.

Thus, it must be written with

Legibility - shape
 - space between letters and words

Uniformity - size
 - line thickness

Lettering on an engineering drawing must be legible.

- *Use the same style of lettering throughout a drawing.*
- ◆ *Single-stroke Gothic is the preferred style.*



- ◆ *Letters must be uniform in size and spacing.*
- ◆ *Letters must be large enough to read after reduction.*

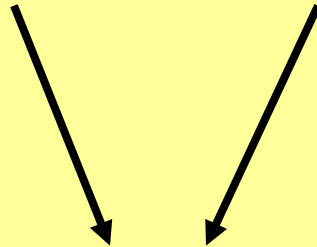


Basic Strokes

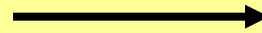
Straight



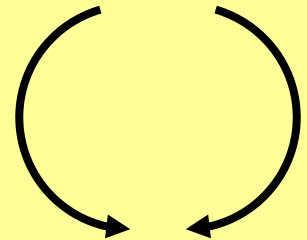
Slanted



Horizontal



Curved

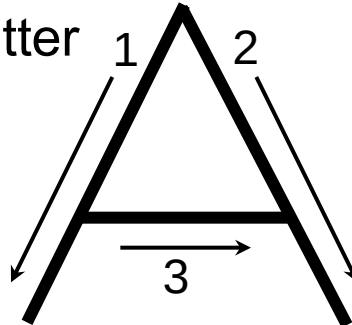


Examples : *Application of basic stroke*

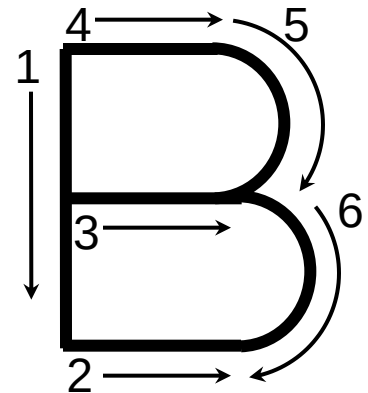
“I” letter



“A” letter

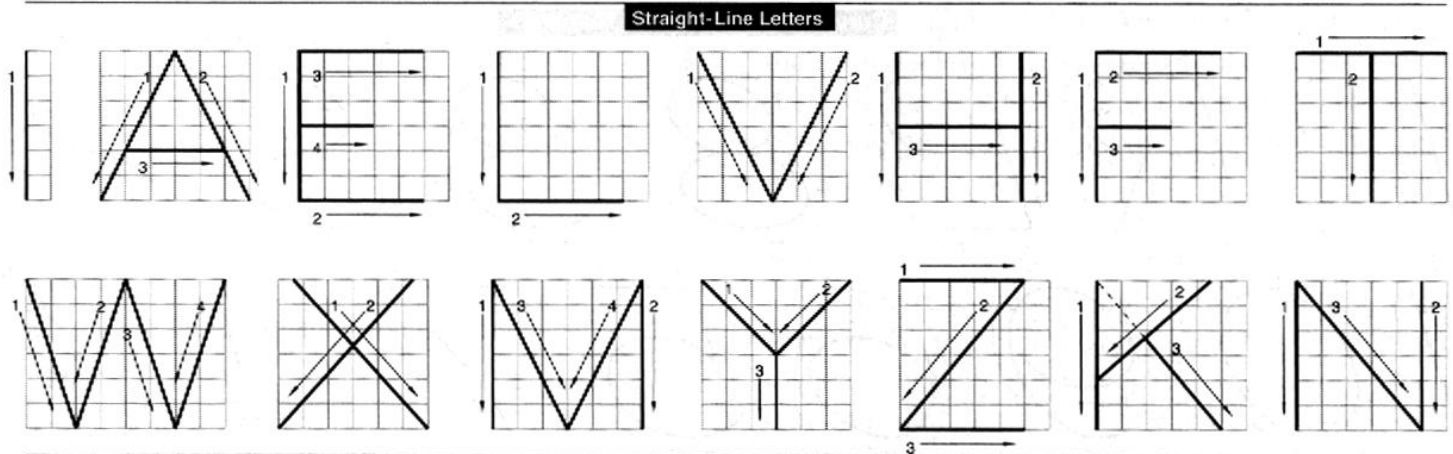


“B” letter

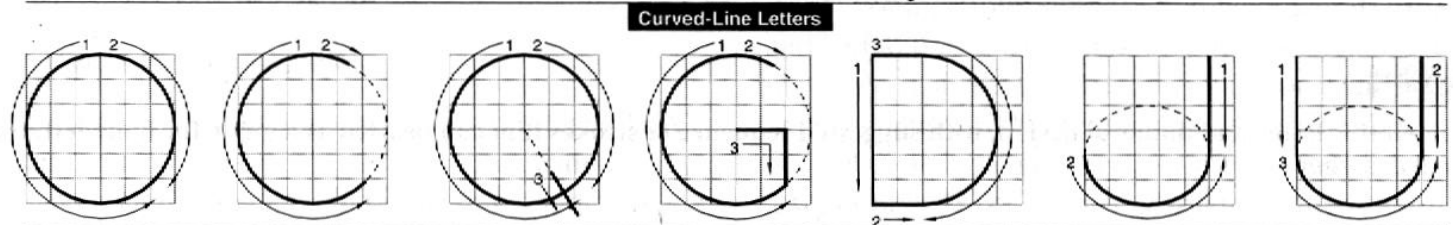


Upper-case letters & Numerals

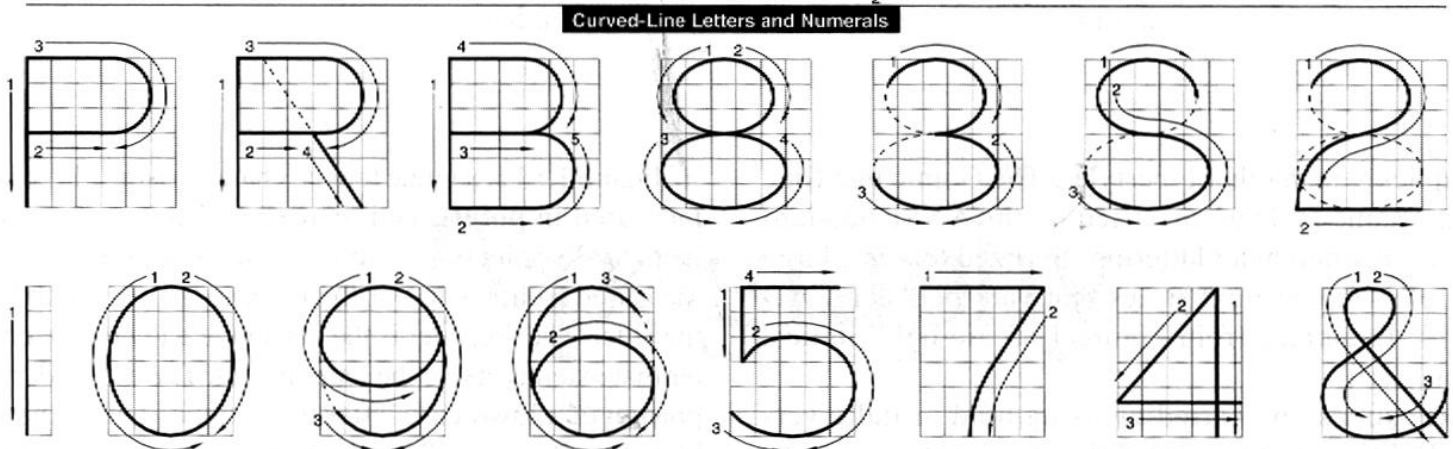
Straight line letters



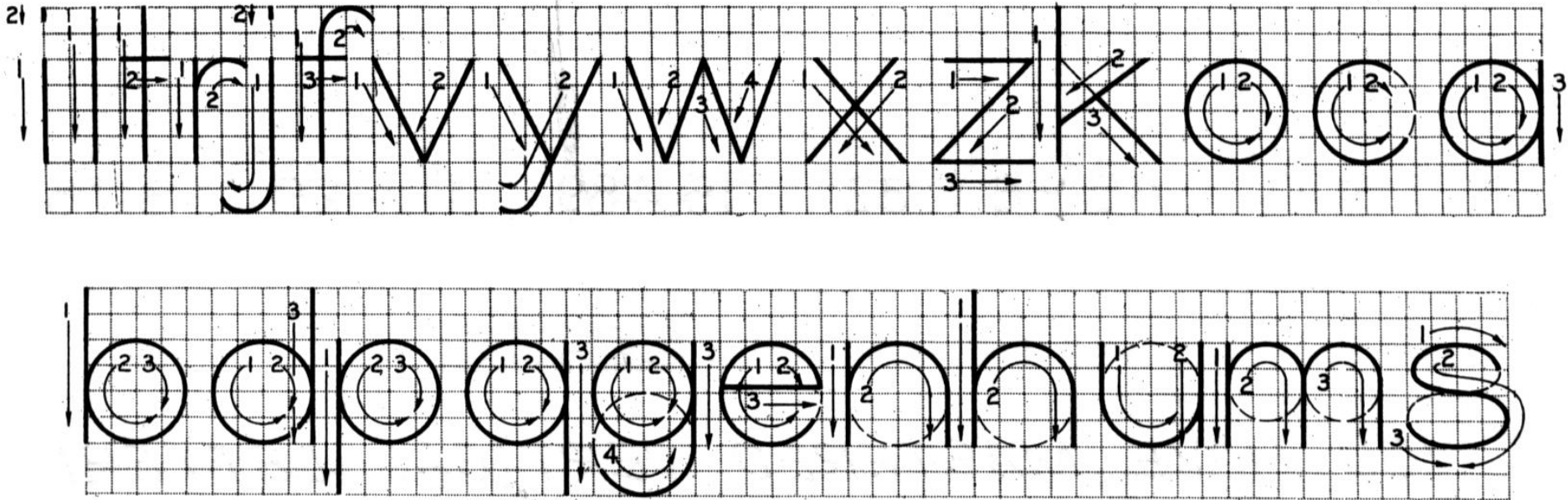
Curved line letters



Curved line letters & Numerals



Lower-case letters



- The text's body height is about $\frac{2}{3}$ the height of a capital letter.

SPACING OF LETTERS AND WORDS

Spacing between Letters

Uniform spacing between letters is done by eye. Contrary to what might seem logical, putting equal distances from letter to letter causes them to appear unequally spaced.

Spacing between Words

Space letters closely within words to make each word a compact unit, but space words well enough apart to clearly separate them from adjacent words.

Spacing between Rows

Be sure to leave space between rows of lettering, usually equal to the letter height.

LATHING

literate

If equal spacing is used from one letter to another, spacing does not actually appear equal, as in this example

LATHING

literate

Space your lettering so that background areas appear equal, as in this example

Word Composition

Look at the same word having different spacing between letters.

A) Non-uniform spacing

JIRAPONG



B) Uniform spacing

JIRAPONG



Which one is easier to read ?

Example : *Good and Poor Lettering*

ESTIMATE

GOOD

EstiMaTE

Not uniform in style.

ESTIMATE
ESTIMATE

Not uniform in height.

EST/MATE
ESTIMATE

Not uniformly vertical or inclined.

ESTIMATE
ESTIMATE

Not uniform in thickness of stroke.

ESTIMATE

Area between letters not uniform.

ABILITY WILL NEVER CATCH UP
WITH THE DEMAND FOR IT

Area between words not uniform.

Sentence Composition

- Leave the space between words equal to the space requires for writing a letter “O”.

Example

ALL O DIMENSIONS O ARE O IN
MILLIMETERS O UNLESS
OTHERWISE O SPECIFIED.

LETTERING FOR TITLES

In most cases, the title and related information are lettered in title boxes or title strips

TOOL GRINDING MACHINE
TOOL REST SLIDE
SCALE : FULL SIZE
AMERICAN MACHINE COMPANY
NEW YORK CITY

DRAWN BY _____ CHECKED BY _____

When lettering by hand, arrange the title symmetrically about an imaginary centerline

