

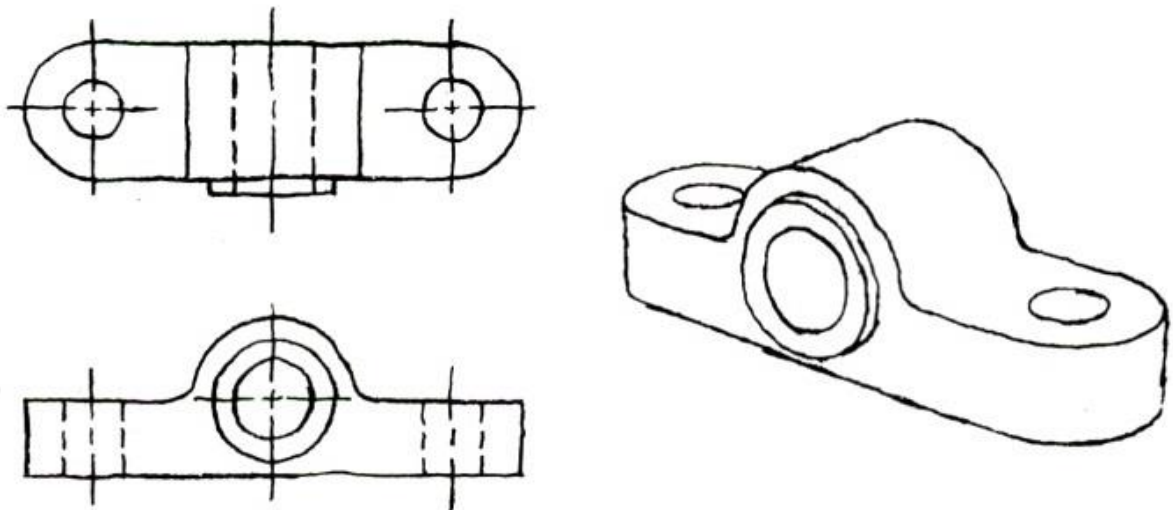
# ENGINEERING DRAWING

## UNIT-1

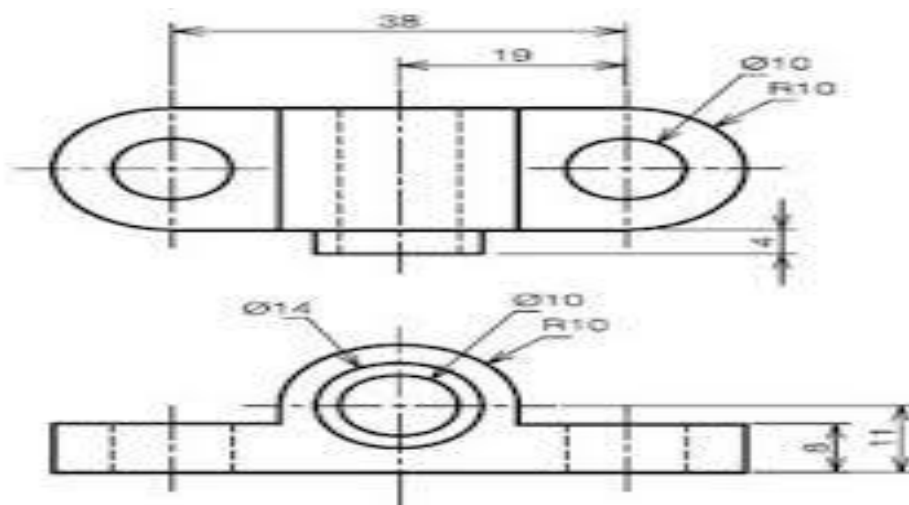
### Introduction to drawing, lines and lettering

- **Drawing**- Drawing, the art or technique of producing images on a surface, usually paper, by means of marks, usually of ink, graphite, chalk, charcoal, or crayon.
- **Types of Drawing**

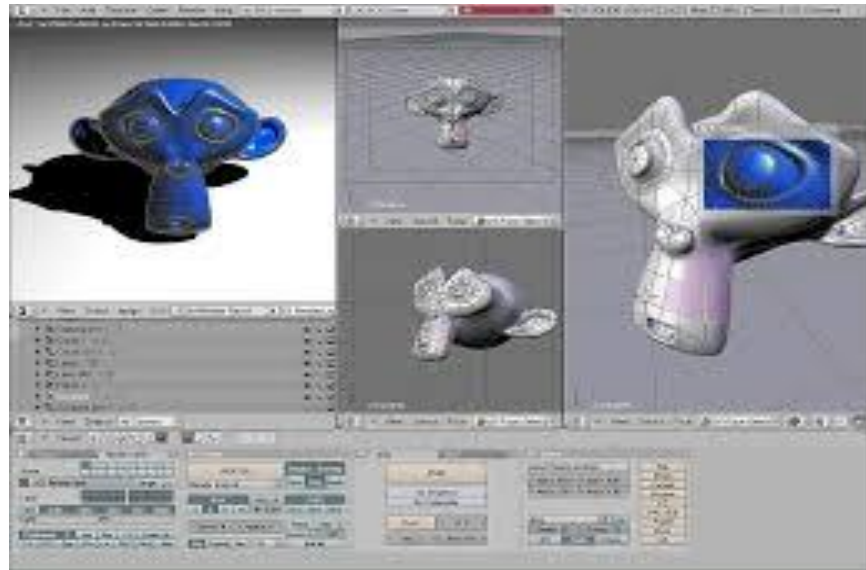
**Freehand Drawing** - drawn or executed by hand without guiding instruments, measurements, or other aids. Example-



**Instrument Drawing** - drawn or executed by drawing instruments such as drawing circles, divider, scale, mini drafter, protractor etc.



**Computer Drawing** – use of computer in making drawing, eg – computer aided drawings.



- **Engineering Drawing**- Engineering drawing is the detailed technical information that enable people understand the product thoroughly. In other words it is widely called as “**Engineer’s language**”.

- **Drawings convey the following critical information:**

**Geometry** – the shape of the object; represented as views; how the object will look when it is viewed from various angles, such as front, top, side, and so on.

**Dimensions** – the size of the object is captured in accepted units.

**Tolerances** – the allowable variations from the nominal size for each dimension.

**Material** – represents what the item is made of.

**Finish** – specifies the surface quality of the item.

- **Use of Drawing in Industry :**

Drawings help us in developing our thoughts and ideas in to a final product. Drawings are also necessary for engineering industries since they are required and are being used at various stages of development of an engineering product In an industry, these drawings help both the technical as well as commercial staffs at various stages like:

- conceptual stage

- design stage
- modification stage
- prototype development stage
- process and production planning
- production
- inspection
- marketing
- Servicing and maintenance, etc.
- 

## **DRAWING INSTRUMENTS AND ACCESSORIES**

The following set of instruments is required for ensuring perfection in manual drawing:

### ➤ **Drawing board**

Drawing board is made of soft wooden platen. Almost perfect planning of the working surface of the drawing board is to be ensured. The standard sizes of the drawing board are shown in Table 1.1 below.

**Table 1.1. Standard dimension of Engineer's Drawing Board**

Designation	Length x Width (mm)	Recommended for use with sheet sizes
D0	1500 x 1000	A0
D1	1000 x 700	A1
D2	700 x 500	A2
D3	500 x 500	A3

D0 and D1 for drawing offices, for students use – D2

### ➤ **Drawing Sheet**

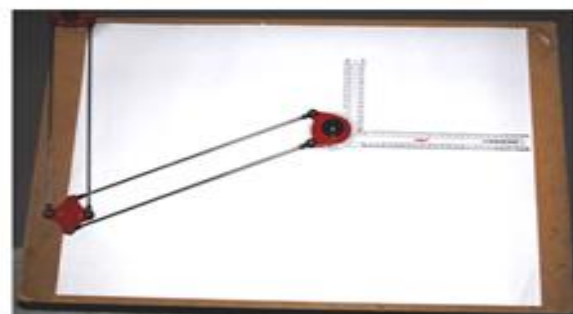
Drawing sheet is the medium on which drawings are prepared by means of pencils or pen. Drawing sheets are available in standard sizes as shown in Table 1.2. A standard A0 size sheet is the one having dimensions of 1189 x 841 mm. Each higher number sheet (A1, A2, A3, etc. in order) is half the size of the immediately lower numbered sheet.

**Table 1.2 Standard Sizes of Drawing sheets as per BIS**

Designation	Size (mm)
A0	841 x 1189
A1	594 x 841
A2	420 x 594
A3	297 x 420
A4	210 x 297

➤ **Mini-drafter**

This is a device used to draw parallel or inclined lines very effectively with ease. This is mounted on the top left corner of the drawing board by means of a clamping mechanism which is an integral part of the device. Figure 2 shows the photograph of a typical college level mini drafter. An L-shaped scale which is graduated in millimetres acts as the working edge of the mini-drafter. The L-Shaped scale also has a degree scale for angle measurement. The working edge can be moved to any desired location on the drawing board.



**Figure 2. Photograph of a typical college level drawing table, drawing board and mini-drafter assembly**

➤ **Set squares :** Set squares are a set of 45° set square and 30°-60° set-square, as shown in figure 3. They are used in conjunction with each other

and with T-square to draw parallel, inclined and perpendicular lines. They are made of transparent acrylic. Each is having bevelled edges with engraved mm or inch marking. The 45° set square generally has a protractor whereas the 30°-60° set-square includes French curves.

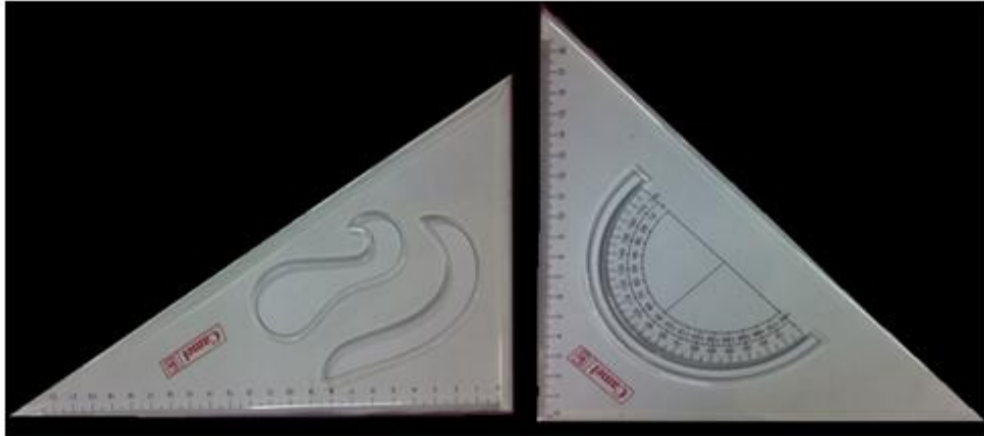


Figure 3. Set Square set

### ➤ Compasses

These are used to draw arcs or circles. Generally two sizes of compasses: one large compass and the other a small spring bow compass are commonly found. Each compass consists of a needle point and a pencil point. For drawing very large radius arcs, the pencil point leg can be removed from the knee joint and a lengthening bar can be inserted to increase the radius of the arc. Figure 4 shows the photograph of a compass.



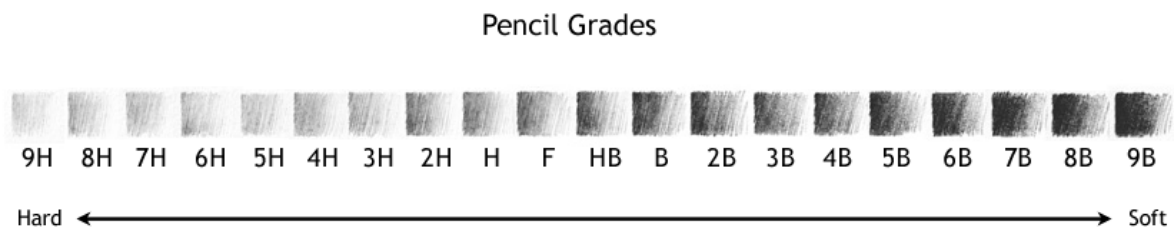
Figure 4. Photograph of a compass

- **Divider:** Dividers are used to transfer lengths to the drawings either from scales or from the drawing itself. Similar to the compasses, two sizes of dividers are used in technical drawings. One large divider and the other small spring bow divider.



## ➤ Pencils

The primary tool used in technical drawings is the pencil or lead sticks. For precision in the drawing of lines, drafting/drawing pencils are made in a number of grades. The grades for the graphite (pencil lead) range from hard to soft. In general, hard pencils draw light lines; soft pencils draw darker and wider lines. The hardest standard grade for drafting/drawing pencils is 9H. The softest pencil is grade 6B.






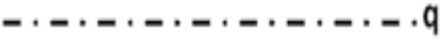



The pencils are available in lead hardness ranging from 6B to 9H and a total of 17 lead types to choose from. Generally for technical drawings, the three grades of pencil used are HB, H and 2H. For different purposes, different grades of pencils are used. Pencil **sharpener** is used to mend the pencils. **Eraser** is used to erase the unnecessary part of the pencil drawing.

# Grades of Pencils used in Lines

TASK	LEAD
CONSTRUCTION LINES	3H, 2H
GUIDE LINES	3H, 2H
LETTERING	H, F, HB
DIMENSION LINES	2H, H
LEADERLINES	2H, H
HIDDEN LINES	2H, H
CROSSHATCHING LINES	2H, H
CENTERLINES	2H, H
PHANTOM LINES	2H, H
STITCH LINES	2H, H
LONG BREAK LINES	2H, H
VISIBLE LINES	H, F, HB
CUTTING PLANE LINES	H, F, HB
EXTENSION LINES	2H, H
FREEHAND BREAK LINES	H, F, HB

## Different types of lines used in drawing

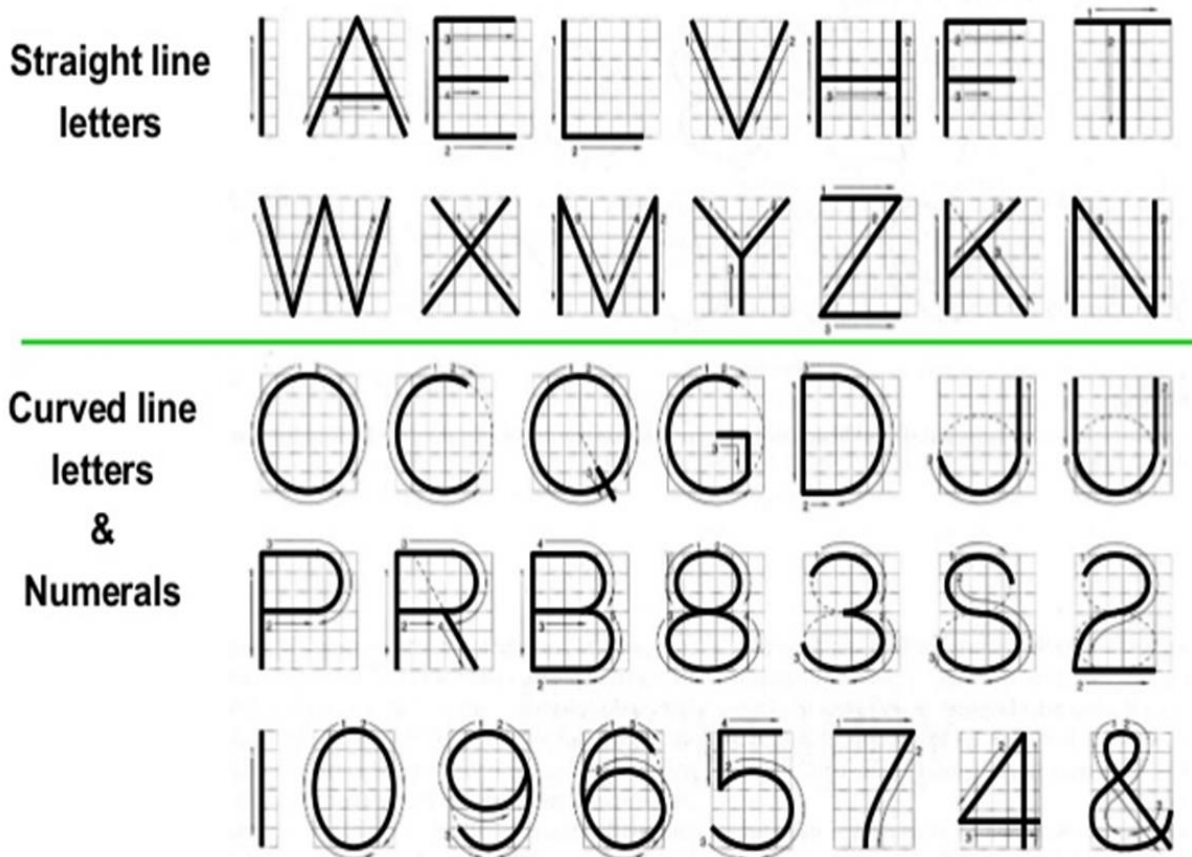
Illustration	Application
<b>Thick</b> 	Outlines, visible edges, surface boundaries of objects, margin lines
<b>Continuous thin</b> 	Dimension lines, extension lines, section lines leader or pointer lines, construction lines, boarder lines
<b>Continuous thin wavy</b> 	Short break lines or irregular boundary lines – drawn freehand
<b>Continuous thin with zig-zag</b> 	Long break lines
<b>Short dashes, gap 1, length 3 mm</b> 	Invisible or interior surfaces
<b>Short dashes</b> 	Center lines, locus lines Alternate long and short dashes in a proportion of 6:1,
<b>Long chain thick at end and thin elsewhere</b> 	Cutting plane lines



# Lettering

- Lettering is used for writing of titles, sub-titles, dimensions, scales and other details on a drawing.
- The Indian standard followed for lettering is BIS: 9609
- Single stroke lettering for use in engineering drawing – width of the stem of the letters and numerals will be uniformly thick equal to thickness of lines produced by the tip of the pencil.
- Single stroke does not mean – entire letter written without lifting the pencil/pen

## Stroking for Upper Case Letters & Numerals



➤ **Lettering types generally used for creating a drawing are**

- **Lettering A** – Height of the capital letter is divided into 14 equal parts
- **Lettering B** – Height of the capital letter is divided into 10 equal parts
- The letter sizes recommended for various items

Sr. No.	Item	Size (mm)
1	Name of the company	10, 14, 20
2	Drawing numbers, letters denoting section planes	10, 14
3	Title of the Drawing	7, 10
4	Sub-titles and heading	5, 7
5	Dimensioning, Notes, Schedules, Material list	3.5, 7
6	Alteration entries and tolerances	3.5