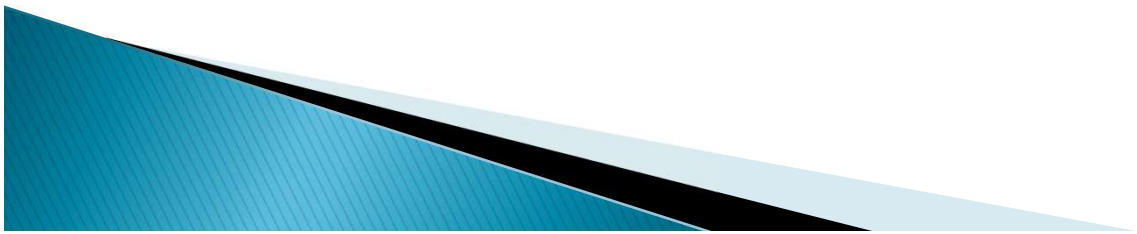
Engineering Drawing

Contents of the Presentation

- Introduction to Engineering Drawing
- Lines and Lettering
- Dimensioning

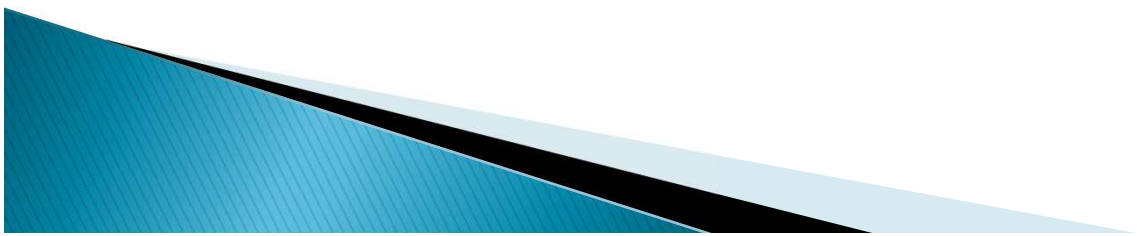


Introduction

- Drawing:

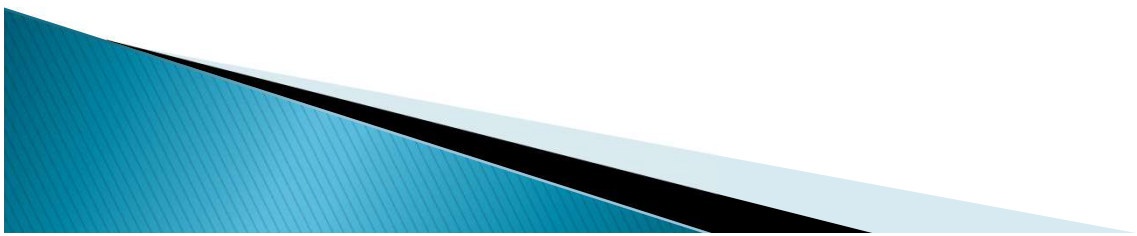
  The way of conveying the ideas through the systematic lines on the paper. The art of representation of an object by systematic lines on a paper.

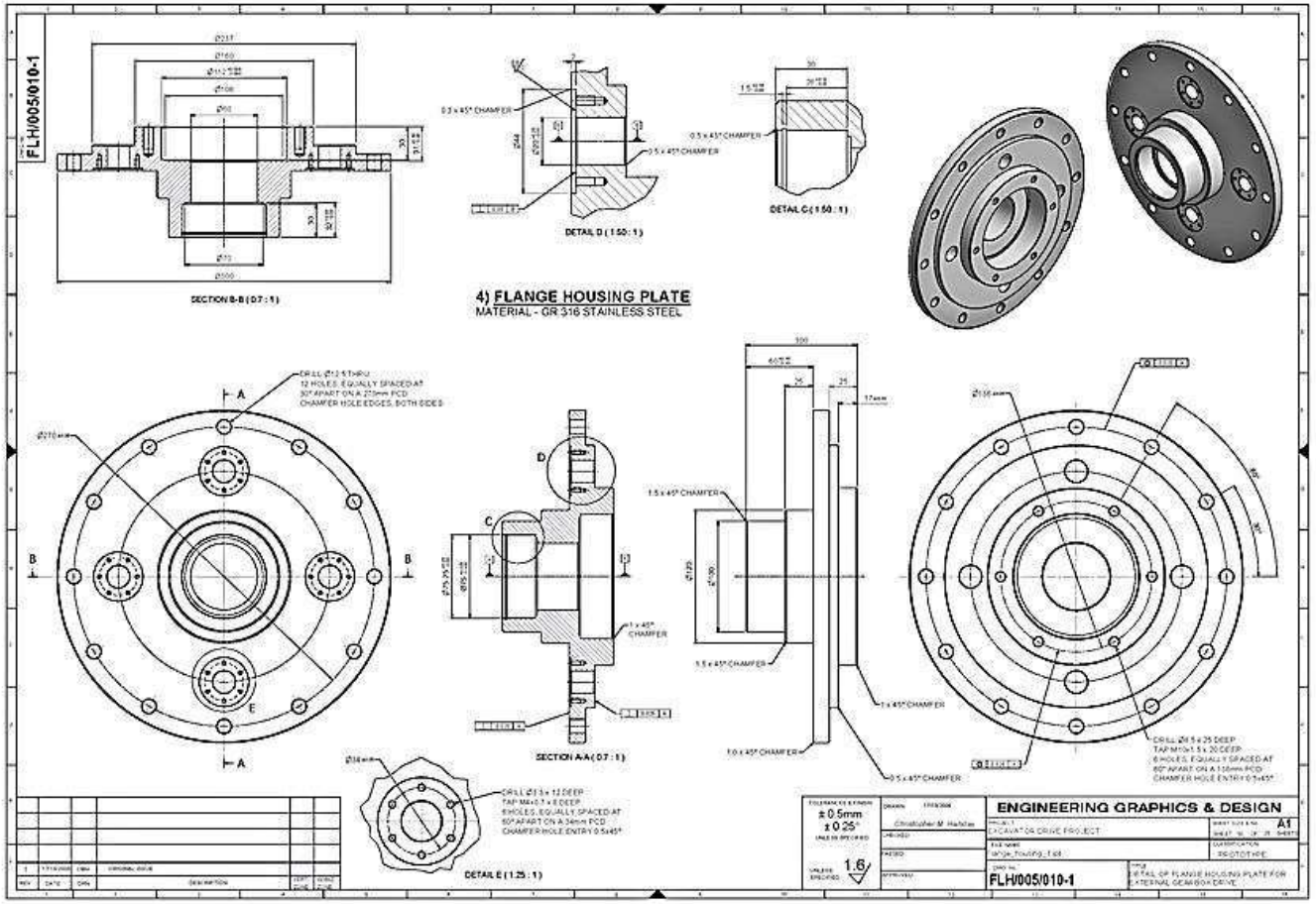
- Types of Drawing:
  1. Artistic Drawing
  2. Engineering Drawing



Engineering Drawing

- An engineering drawing is a type of technical drawing, is used to fully and clearly define requirements of an engineered items.
- More than merely the drawing of pictures, it is also a language, a graphical language, that communicates ideas and information from one mind to another.
- Most especially, it communicates all needed information from the engineer who designed a part to the workers who will make it.

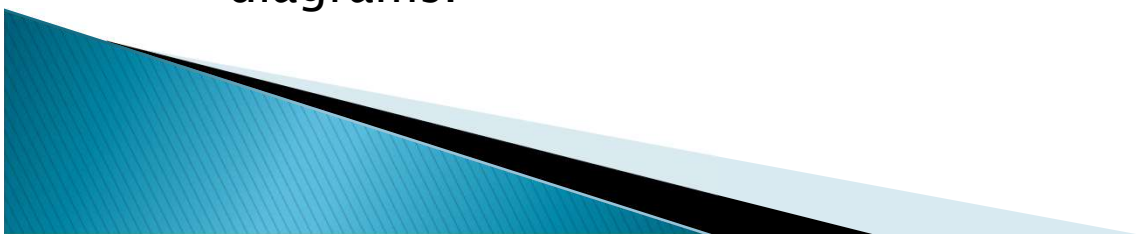




Simply, It is an art of representation of engineering objects. e.g. buildings, roads, machines, etc.

Types of Engineering Drawing

1. **Geometrical Drawing:**
   e.g. geometrical objects – rectangle, square, cube, cone, cylinder, etc.
   A. Plain Geometrical Drawing:
   Two dimensional drawing having only length and breadth. e.g. square, triangle, etc.
   B. Solid Geometrical Drawing:
   Three dimensional drawing having length, breadth and thickness. e.g. cube, prism, etc.
2. **Mechanical Engineering or Machine Drawing:**
   e.g. mechanical engineering objects – machines, machine parts, etc.
3. **Civil Engineering Drawing:**
   e.g. civil engineering objects – roads, buildings, bridges, dams, etc.
4. **Electrical & Electronics Engineering Drawing:**
   e.g. electrical and electronics objects – transformers, wiring diagrams.



Application of Engineering Drawing

Ships

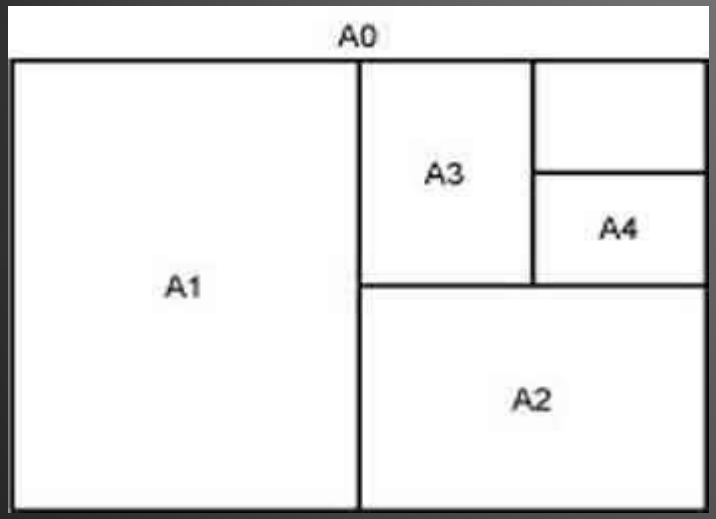
Manufacturing of Automobiles

Construction

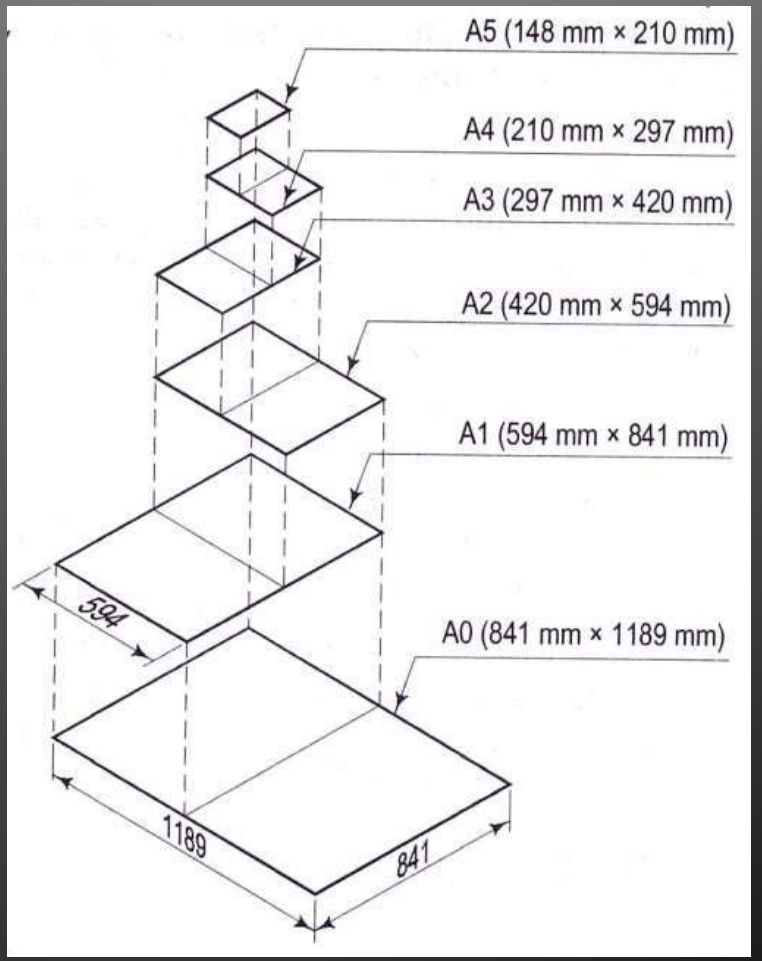
Drawing Instruments

1. Drawing Board
2. Drawing Sheet
3. Drawing Sheet Holder
4. Set-squares – 45° and 30°-60°
5. Large size Compass
6. Small bow Compass
7. Large size Divider
8. Small bow Divider
9. Scales – 6” and 12”
10. Protractor
11. French Curve
12. Drawing Pencils – H, 2H, HB
13. Sand Paper
14. Eraser (Rubber)
15. Drawing Pins and Clips
16. Cello Tape
17. Duster or Handkerchief
18. Drafting Machine / Mini Drafter
19. Sketch Book (Medium size)
20. Roller Scale
21. Pencil Sharpener
22. Sheet Folder

Type of Drawing Sheets

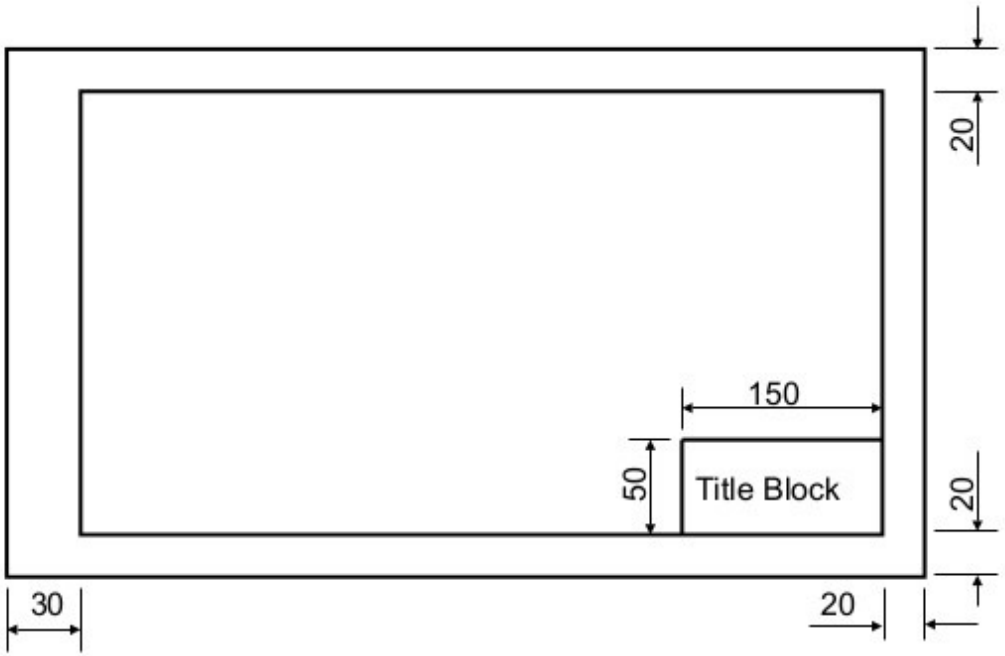


Designation	Trimmed Size (mm)	Untrimmed size (mm)
A0	841 x 1189	880 x 1230
A1	594 x 841	625 x 880
A2	420 x 594	450 x 625
A3	297 x 420	330 x 450
A4	210 x 297	240 x 330



Layout of a Drawing Sheet

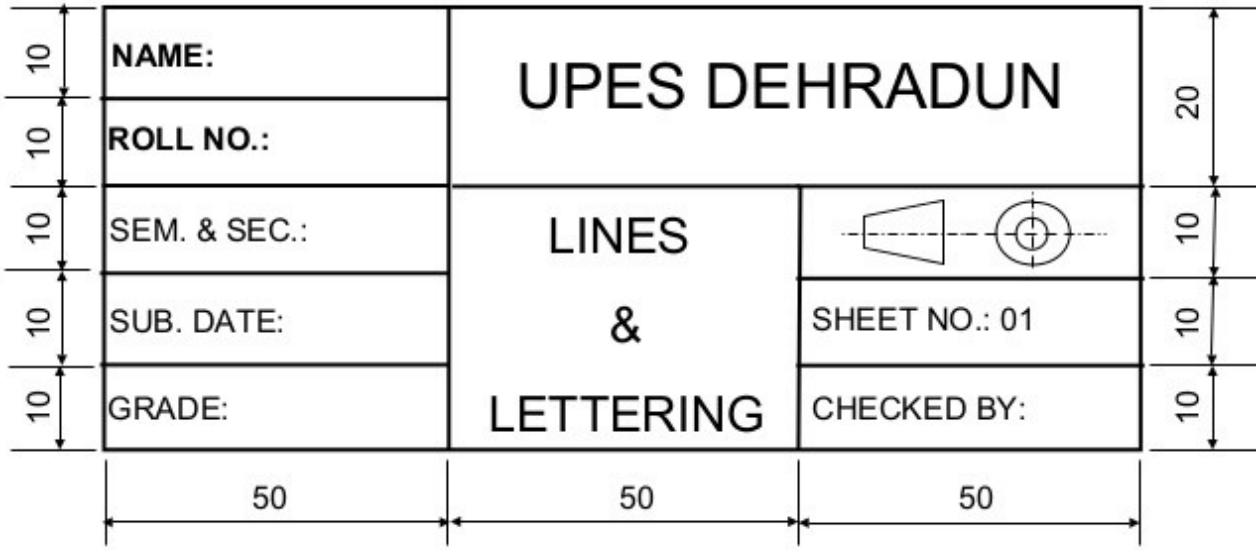
Layout of Drawing Sheet



All the dimensions are in millimeters.

Title Block

Title Block (Sample)



NOTES:

All the dimensions are in millimeters.

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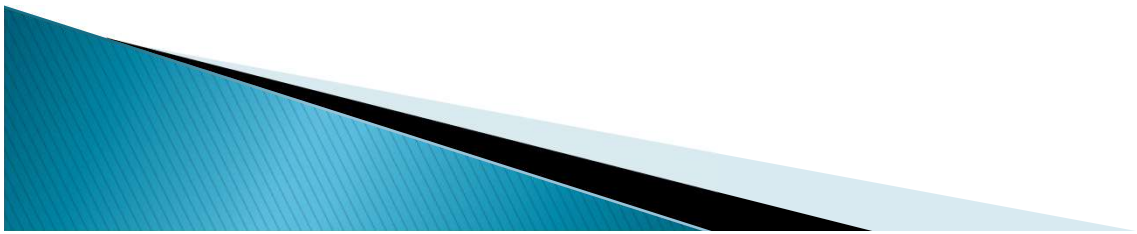


Lines

- **Line Thickness:**
  Thickness varied according to the use of pen or pencil and the size & type of the drawing.
- For pencil, the lines can be divided into two line-groups:

Line-group (mm)	Thickness	Lines
0.2	Medium	Out lines, dotted lines, cutting plane lines
0.1	Thin	Centre lines, section lines, dimension lines, extension lines, construction lines, leader lines, short-break lines and long break lines.

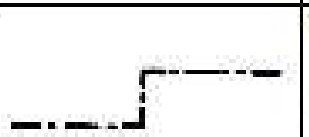
Important Notes:

- In the finished drawing, all lines except construction lines should be dense, clean and uniform. Construction lines should be drawn very thin and faint and should be hardly visible.

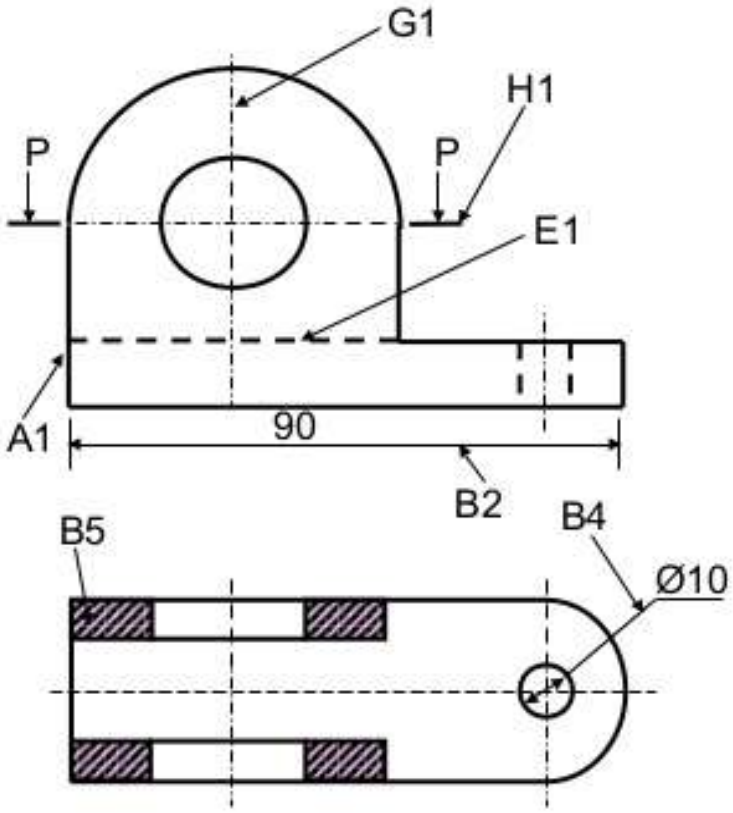
Types of Lines

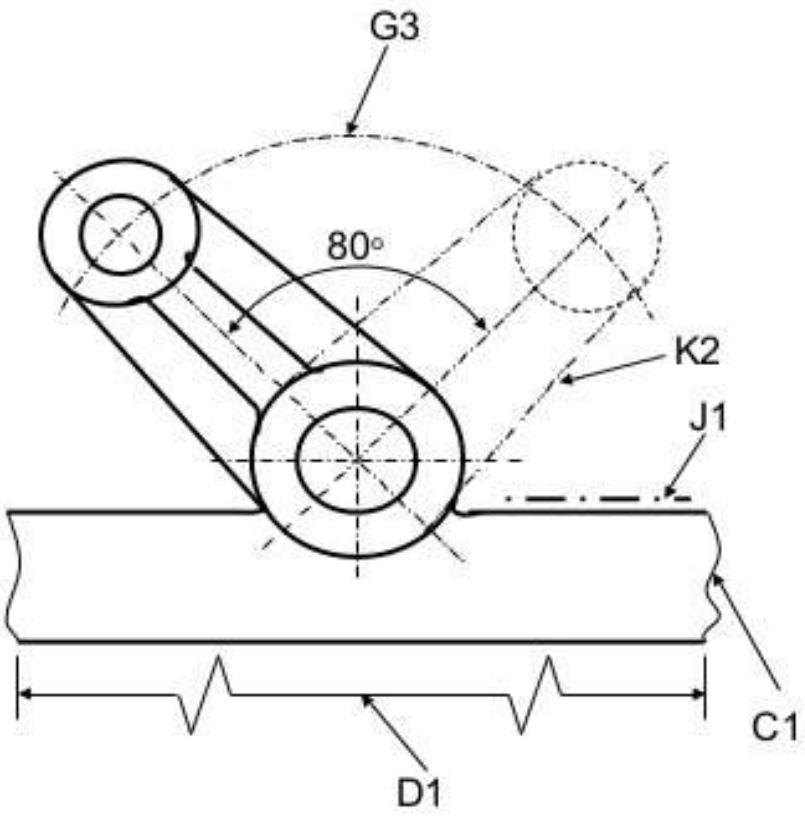
Line		Description	General Application	
A		Continuous thick	A1 A2	Visible outlines. Visible edges.
B		Continuous thin (straight or curved)	B1 B2 B3 B4 B5 B6 B7	Imaginary lines of intersection. Dimension lines. Projection lines. Leader lines. Hatching lines. Outlines of revolved sections in place. Short centre lines
C		Continuous thin free hand	C1	Limits of partial or interrupted views and sections, If the limit is not a chain thin.
D		Continuous thin (straight) with zigzags	D1	Long break line
E		Dashed thick	E1 E2	Hidden outlines. Hidden edges.

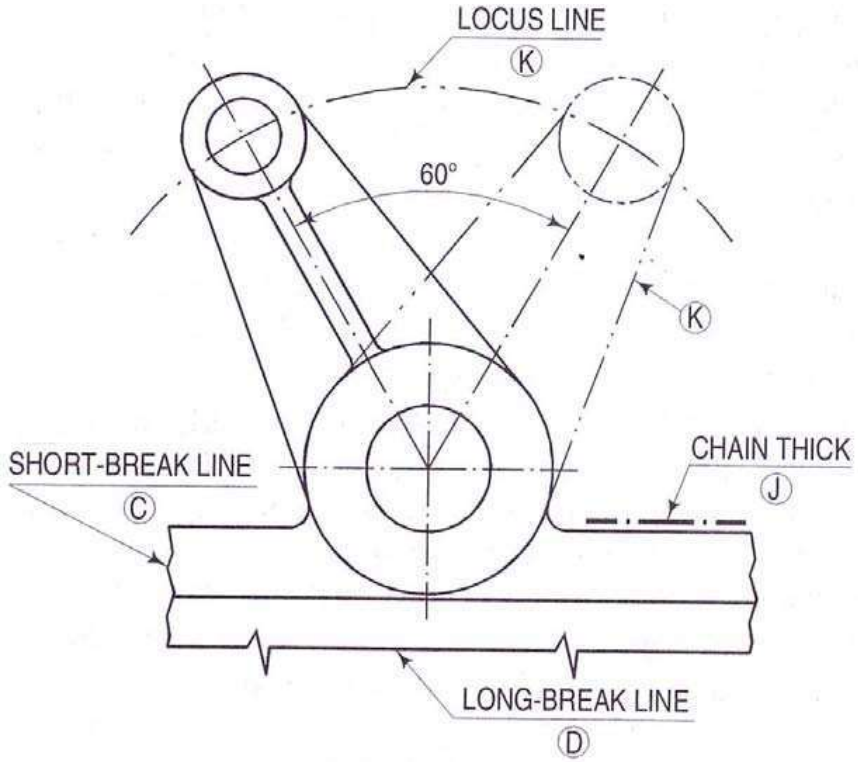
Types of Lines

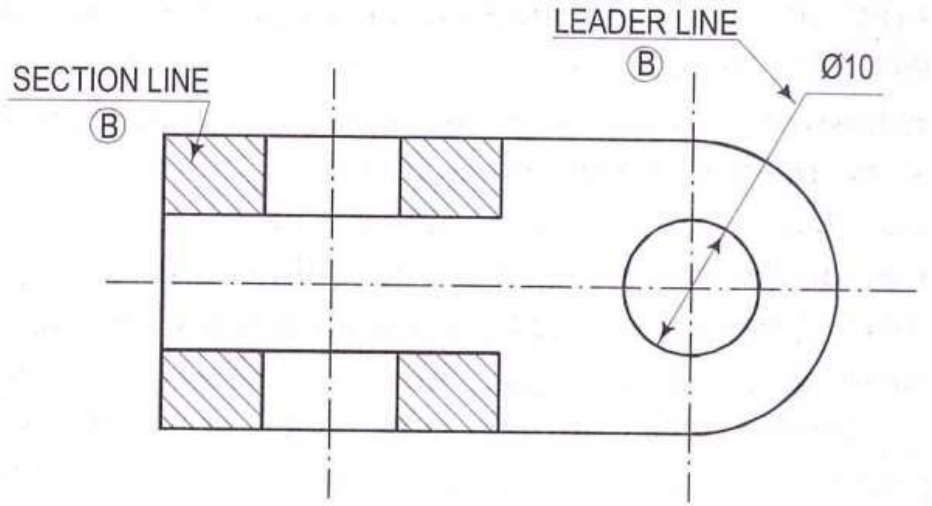
F		Dashed thin	F1 F2	Hidden outlines. Hidden edges.
G		Chain thin	G1 G2 G3	Center lines. Lines of symmetry. Trajectories
H		Chain thin, thick at ends and changes of direction	H1	Cutting planes.
J		Chain thick	J1	Indication of lines or surfaces to which a special requirement applies
K		Chain thin double dashed	K1 K1 K3 K4 K5	Outlines of adjacent parts. Alternative or extreme position of movable parts. Centroidal lines. Initial outlines prior to forming Parts situated in front of the cutting plane

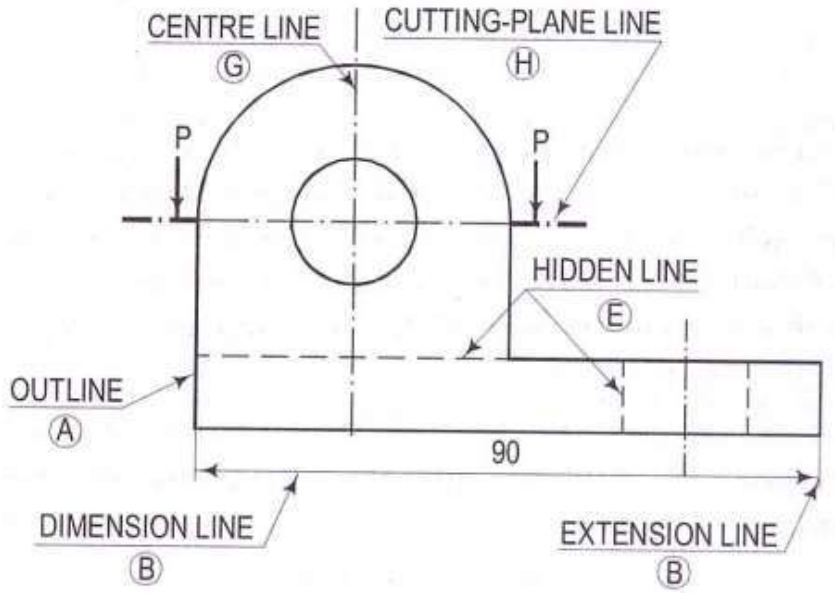
Application of various Types of Lines






LOCUS LINE
K
60°
K
SHORT-BREAK LINE
C
CHAIN THICK
J
LONG-BREAK LINE
D


LEADER LINE
B
SECTION LINE
B
Ø10


CENTRE LINE
G
CUTTING-PLANE LINE
H
P
P
HIDDEN LINE
E
OUTLINE
A
90
DIMENSION LINE
B
EXTENSION LINE
B

Lettering

- Writing of titles, dimensions, notes and other important particulars on a drawing is lettering.

- **Classification:**

1. **Single-stroke Letters:**

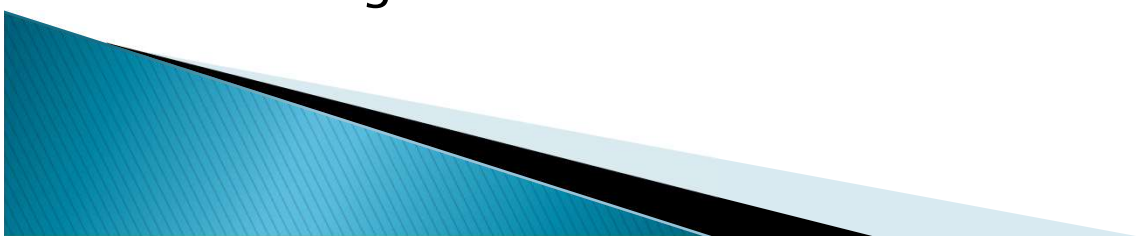
   The thickness of the line of the letter is obtained in one stroke of the pencil.

- Recommended by B.I.S.
- It has two types:

I. Vertical

II. Inclined (slope 75° with the horizontal)

- The ratio of height to width varies but in most of the cases it is 6:5.
- Lettering is generally done in capital letters.
- The lower-case letters are generally used in architectural drawings.



- The spacing between two letters should not be necessarily equal.
- The letters should be so placed that they do not appear too close together too much apart.
- The distance between the words must be uniform and at least equal to the height of the letters.
- Lettering, except the dimension figures, should be underlined to make them more prominent.

- **Size of Alphabets for Drawing:**
  - Main titles ----------6-8 mm
  - Sub titles ----------3-6 mm
  - Notes, dimension figures, etc. ----------3-5 mm
  - Drawing no.----------10-12 mm


d
d/2
ABCDEFGHIJKLMN
OPQRSTUVWXYZ
1234567890
abcdefghijklmnopqrs
tuvwxyz

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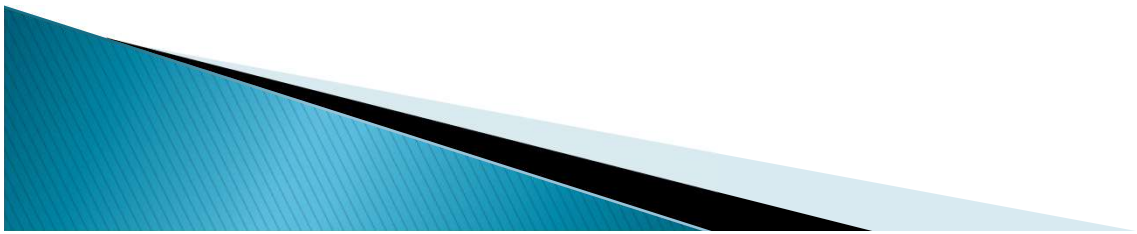


Dimensioning

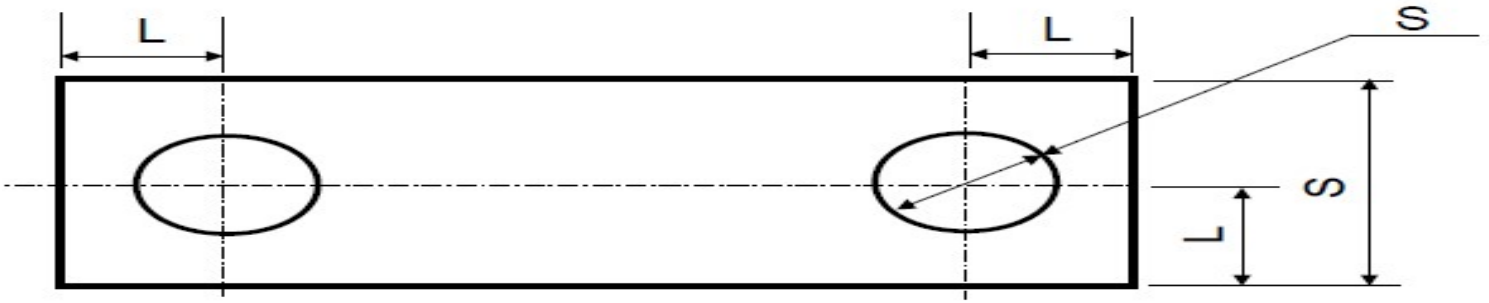
- The art of writing the various sizes or measurement on the finished drawing of an object.

- Types of Dimensioning:
  1. Size or Functional Dimensions (S):

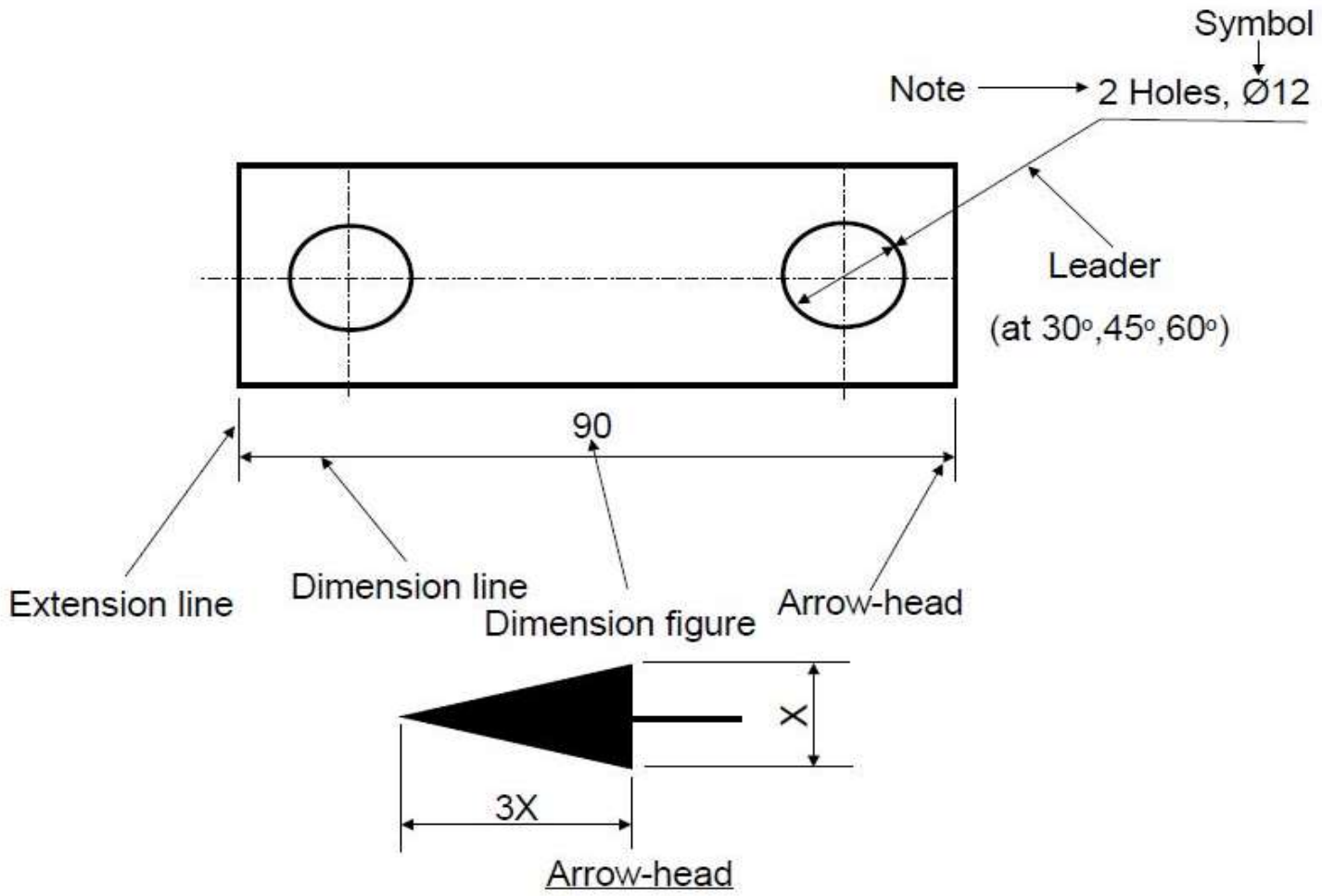
     It indicates sizes.

     e.g. length, breadth, height, diameter, etc.
  2. Location or Datum Dimensions (L):

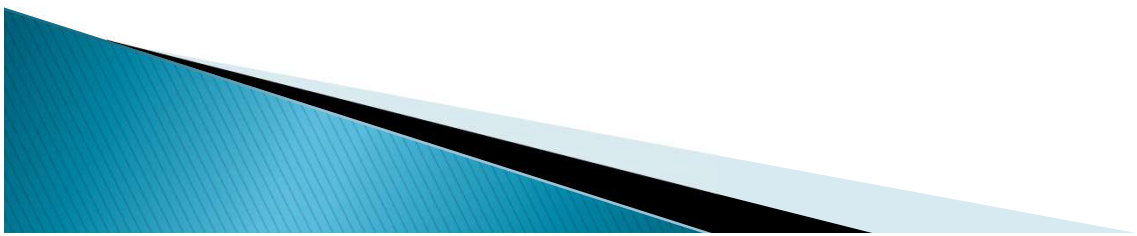
     It shows location or exact position of various constructional details within the object.



Notations of Dimensioning



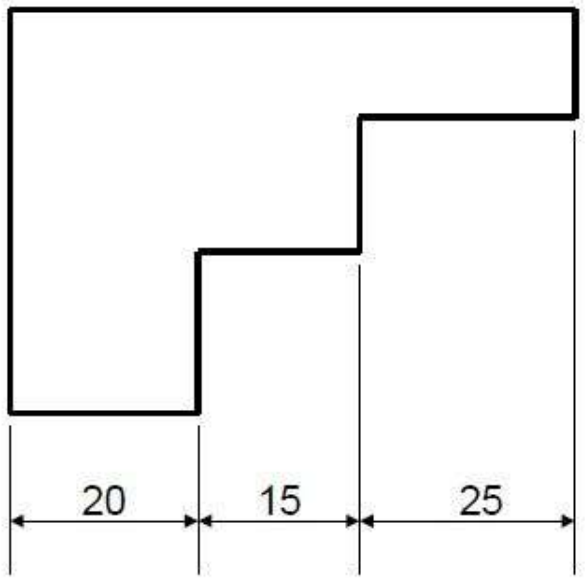
1. **Dimension line:**
   Thin continuous line used to indicate the measurement.
2. **Extension line:**
   Thin continuous line extending beyond the outline of the object.
3. **Arrow-head:**
   Used to terminate the dimension line. Length : width ratio is 3:1. Space filled up.
- **Note:**
  Gives information regarding specific operation relating to a feature.
4. **Leader:**
   Thin continuous line connecting a note or a dimension figure with the feature to which it is applied.
   Terminated by arrow-head or dot.
5. **Symbol:**
   The representation of any object by some mark on the drawing.
   It saves time and labour.



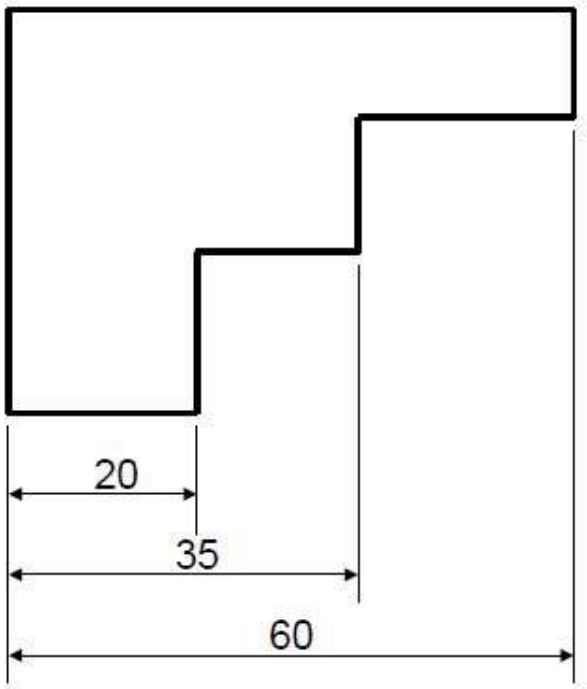
Units of Dimensioning

- As for as possible all dimensions should be given in millimetres omitting the abbreviation mm.
- If another unit is used, only the dimension figures should be written. But a foot note such as ‘All the dimensions are in centimetres' is inserted in a prominent place near the title box.
- e.g. 15.50
- 0.75 (Zero must precede the decimal point)
- 15.50 ± .75 (Zero is omitted)

The ways of placing the dimension in a series

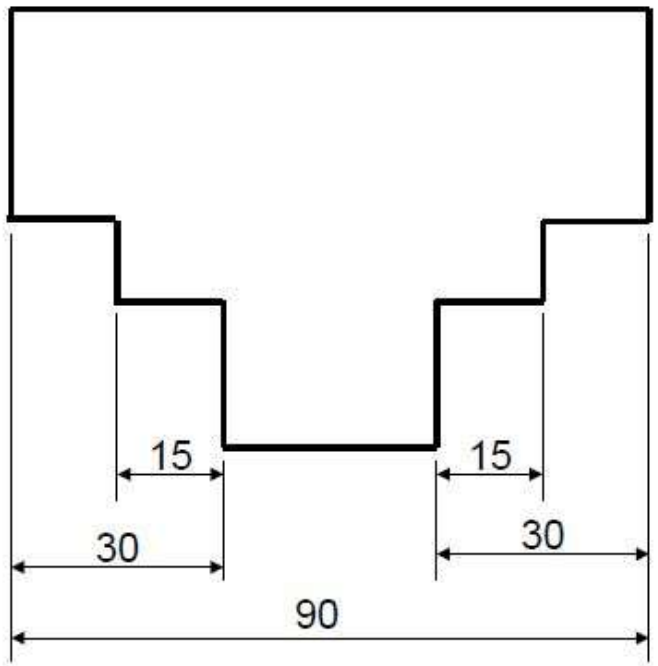


Chain

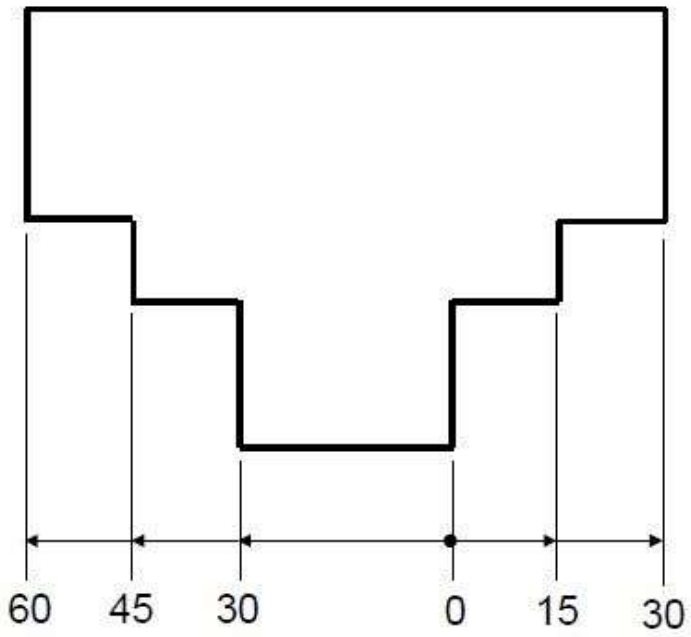


Parallel

The ways of placing the dimension in a series



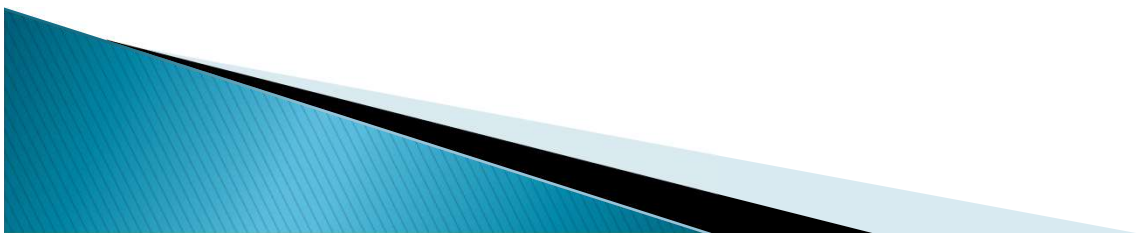
Combined



Progressive

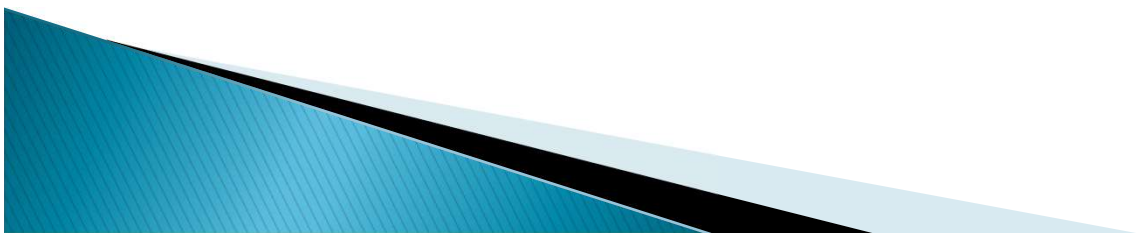
The ways of placing the dimension in a series

1. **Chain Dimensioning:**
   Dimensions are arranged in a straight line.
2. **Parallel Dimensioning:**
   All the dimensions are shown from a common base line. The smaller dimension is placed nearer the view.
3. **Combined Dimensioning:**
   Chain and parallel dimensioning used simultaneously.
4. **Progressive Dimensioning:**
   One datum or surface is selected which reads as zero. All the dimensions are referred to that point or surface.

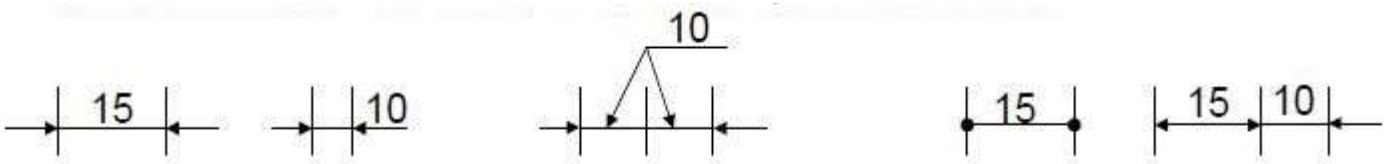


Some Important Rules of Dimensioning

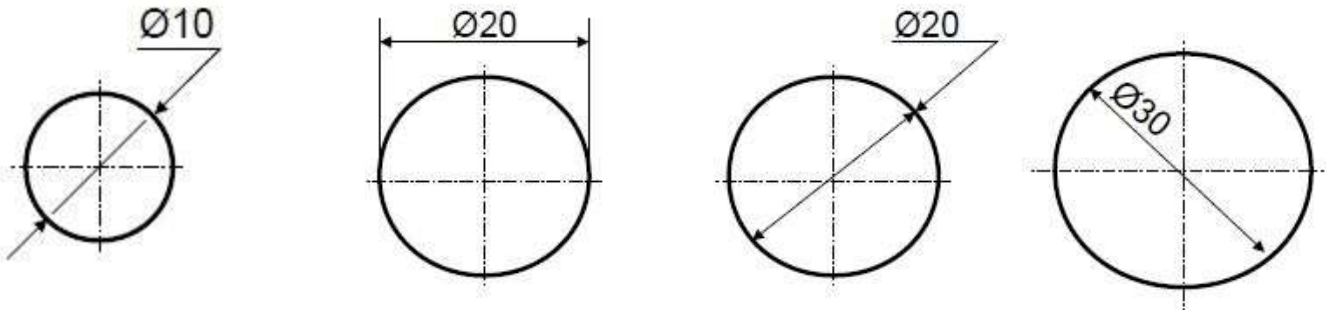
1. All the dimensions necessary for the correct functioning of the part should be expressed directly on the drawing.
2. Every dimension should be given, but none should be given more than once.
3. A dimension should be placed on the view where its use is shown more clearly.
4. Dimensions should be placed outside the view, as for as possible.
5. Mutual crossing of dimension lines and dimensioning between hidden lines should be avoided. Also it should not cross any other line of the drawing.



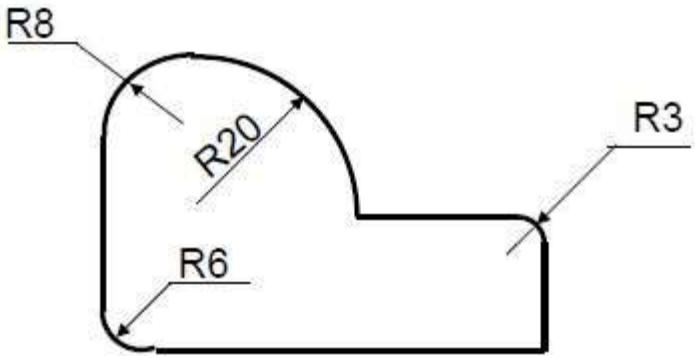
6. An outline or a centre line should never be used as a dimension line. A centre line may be extended to serve as an extension line.
7. Aligned system of dimensioning is recommended.
8. Dimension lines should be drawn at least 8 mm away from the outlines and from each other.
9. The extension line should be extended by about 3 mm beyond the dimension line.
10. When the space is too narrow, the arrow-head may be placed outside. Also a dot may be used to replace an arrow-head.



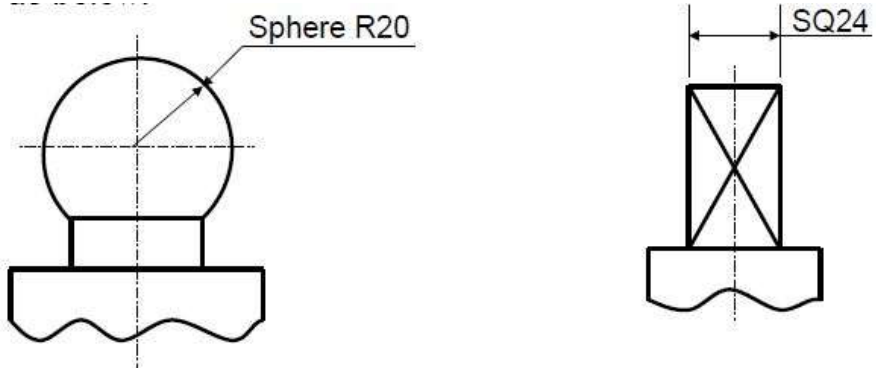
11. The various methods of dimensioning different sizes of circles are as follows:



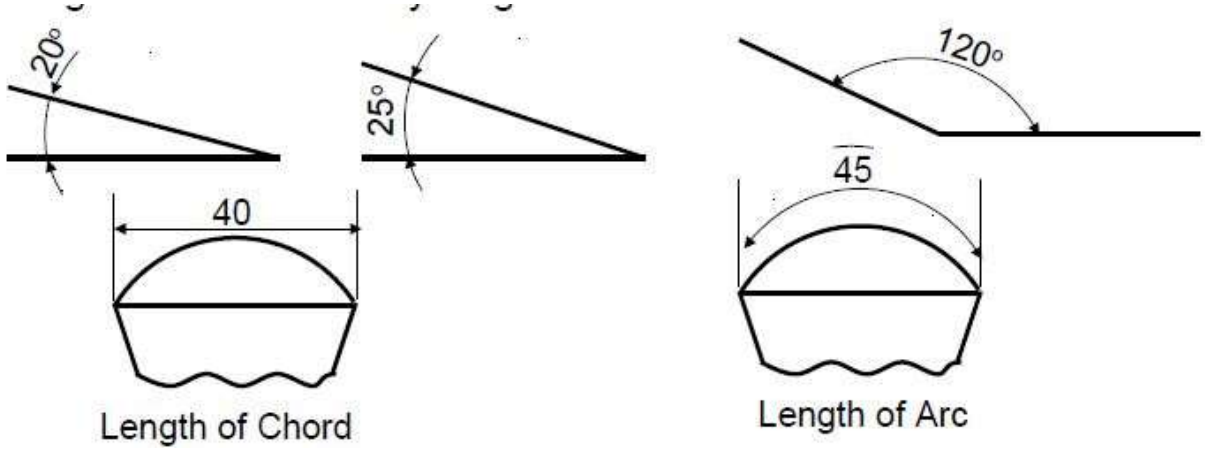
12. Arcs of circles should be dimensioned by their respective radii.



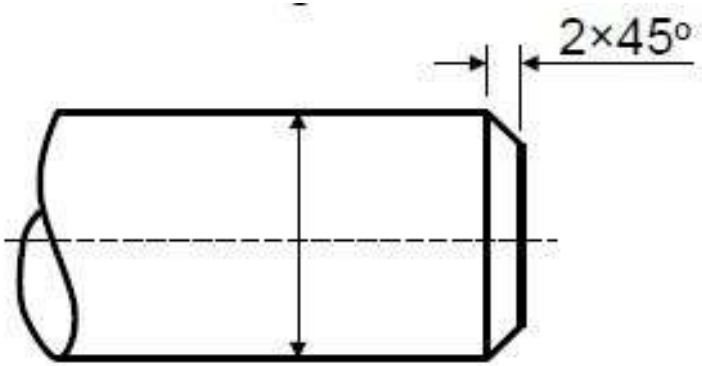
13. Radii of a spherical surface and square cross section of a rod is shown as below:



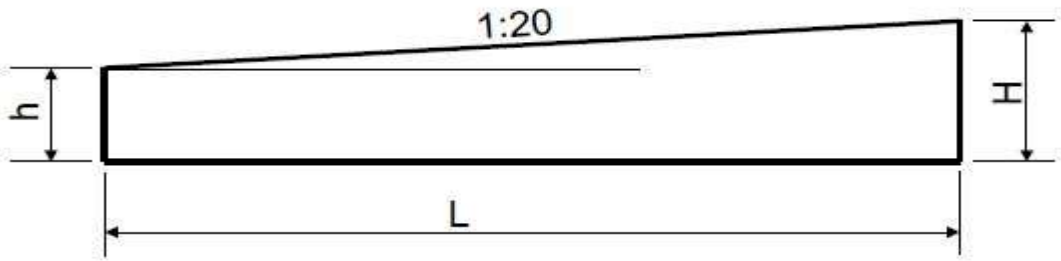
14. Angular dimension may be given as follows:



15. Method of dimensioning of Chamfer:



16. Dimensioning of Tapered Surface:



Slope or Taper = (H-h)/L

THANK YOU