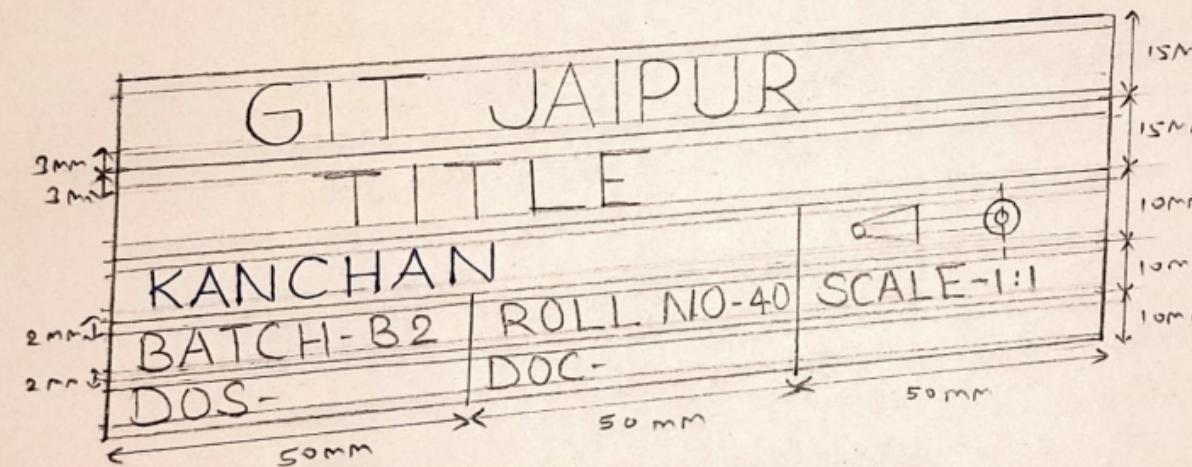


Machine Drawing :- It is pertaining to machine parts or components. It is presented through a number of orthographic views, so that the size & shape of the component is fully understood.

Title Block



Types of lines

Lines	Pencil
<ul style="list-style-type: none"> Initial work & construction lines Outlines, dotted lines, section-plane lines, dimension lines, arrowheads Centre lines, section lines 	H 2H

Lines	Description	General Application.
A ——————	Continuous thick or continuous wide	Visible outline, visible edges; crests of screw threads; limits of length of full depth thread, lines of cuts & sections; arrows; parting lines of moulds in views; main representations in diagrams, maps, flowcharts; system lines (Structural metal engg.)
B ——————	Continuous thin (narrow) (Straight or curved)	Imaginary lines of intersection; grid dimension, extension, project, short centre, leader, reference lines; hatching; outlines of revolved sections; roots of screw threads; interpretation lines of tapered feature; framing of details; indication of repetitive details;
C ~~~~~	Continuous thin (narrow) freehand.	limits of partial or interrupted views & sections, if the limit is not a chain thin line.
D ——————	Continuous thin (narrow) with zigzags (straight)	long-break lines
E ————	Dashed thick (wide)	line showing permissible of surface treatment.
F ————	Dashed thin (narrow)	Hidden outlines; Hidden edges.
G: - - - - -	chain thin long-dashed dotted (narrow)	Centre line; lines of symmetry; trajectories; pitch circle of gears, pitch circle of holes.

Lines	Description	General Application.
H Thick Thin Thick — · — — — · — —	Chain thin (narrow) with thick(wide) at the ends & at changing of position.	Cutting planes
I — · — — — · —	Chain thick or long dashed dotted (wide)	Indication of lines or surfaces to which a special requirement applies.
J — · — — — — · —	Chain thin double-dashed or longed -dashed double-dotted (narrow)	Outlines of adjacent parts. Alternative & extreme position of movable parts, centrodial parts, Initial outlines prior to forming parts situated in front of the cutting plane.

Dimensioning

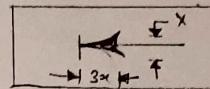
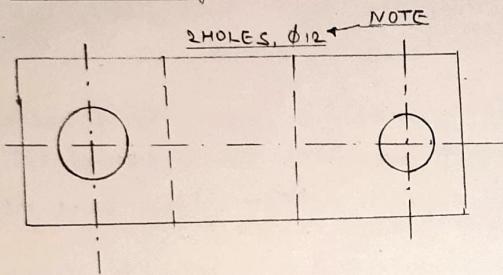
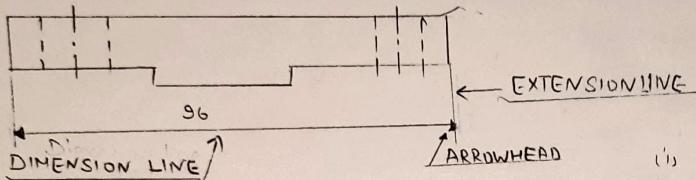
Dimension is a numerical value expressed in appropriate units of measurement & indicated on drawing, using lines, symbols, notes etc. so that all features are completely defined.

Dimensioning Terms & Notations

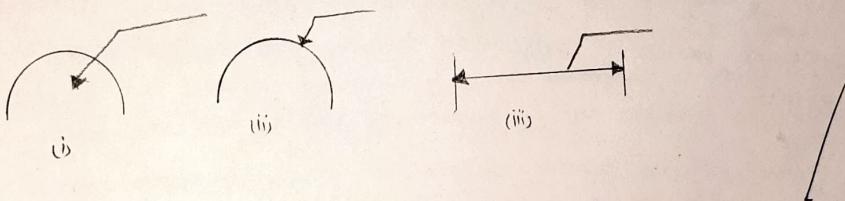
- (1) Dimension line :- Dimension line is a thin continuous line. It is terminated by arrowheads touching the outlines, extension lines or centre lines.
- (2) Extension line :- An extension line is also a thin continuous line drawn as extension of an outline. Formerly the BIS's had recommended that a gap of about 1mm should be kept between the extension line & an outline or object boundary. It extends by about 3mm beyond the dimension line.
- (3) Arrowhead line :- The Arrowhead is placed at each end of a dimension line. Its pointed end touches an outline, an extension line or a centre line. The size of an arrowhead should be proportional to the thickness of the outlines. The length of the arrowhead should be 3 times of its maximum width. It is drawn freehand with two strokes made in direction of its pointed end. The space between them is closed & filled. Arrowhead is widely used in engineering drawing.

Note:- A note gives information regarding specific operation relating to a feature. It is placed outside a view but adjacent to the feature concerned. It is so written that it may be read when the drawing is viewed from the bottom edge.

- (4) Leader :- A leader or a pointer is a thin continuous line or a dimension figure with the feature to which it applies. One end of the leader terminates either in an arrowhead or a dot. The arrowhead touches the outline, while the dot is placed within the outline of the object.
- The other end of the leader of the note is terminated in a horizontal line at bottom level of the first or the last letter of the note. The leader is never drawn vertical or horizontal or curved. It is drawn at a convenient angle of not less than 30° to the line to which it touches. When pointing to a circle or an arc it is drawn rapidly. Use of common leaders for more than one feature should never be made.



- (i) OPEN ($< 90^\circ$)
- (ii) OPEN ($< 120^\circ$)
- (iii) CLOSED
- (iv) CLOSED AND FILLED
- (v) OBLIQUE STROKE
- (vi) SMALL OPEN CIRCLE



SECTIONAL VIEWS

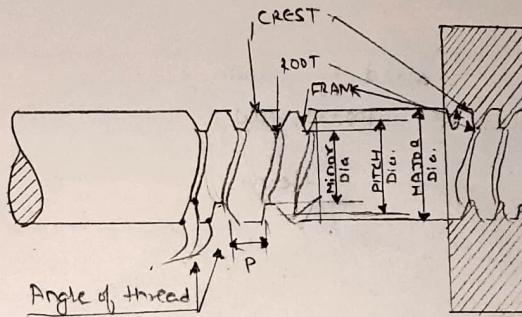
A Sectional view is obtained by imaging the object, as if cut by a cutting plane & the portion between the observer & the section plane being removed.

Types of Sections :-

- 1) Full Section:- A sectional view obtained by assuming that the object is completely cut by a plane is called a full section or sectional view.
- 2) Half Section:- A half sectional view is preferred for symmetrical object. For a half section, the cutting plane removes only one quarter of an object. For a symmetrical object, a half sectional view is used to indicate both interior & exterior details in the same view.
- 3) Auxiliary Section:- Auxiliary sections may be used to supplement the principal views used in orthographic projections. A sectional view projected on an auxiliary plane, inclined to the principal planes of projection, shows the cross-sectional shapes of features such as arms, ribs & so on.

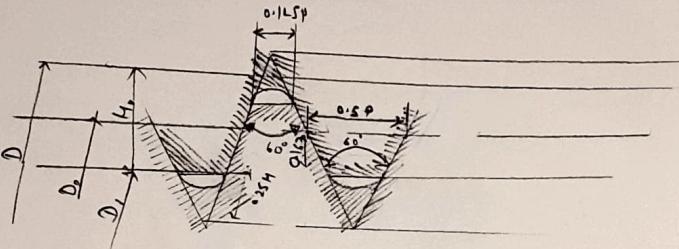
SCREWED FASTENERS

Screw thread Nomenclature :-



1. Major (Nominal) Diameter:- This is the largest diameter of a screw thread, touching the crests on an external thread or the roots of an internal thread.
2. Minor (Core) Diameter:- This is the smallest diameter of a screw thread, touching the roots or core of an external thread (root or core diameter) or the crests of an internal thread.
3. Pitch Diameter:- This is the diameter of an imaginary cylinder, passing through the threads at the points where the thread width is equal to the space between the threads.
4. Pitch:- It is the distance measured parallel to the axis, between corresponding points on adjacent screw threads.
5. Lead:- It is the distance a screw advances axially in one turn.
6. Flank:- Flank is the straight portion of the surface, on either side of the screw thread.
7. Crest:- It is the peak edge of a screw thread, that connects the adjacent flanks at the tops.
8. Root:- It is the bottom edge of the thread that connects the adjacent flanks at the bottom.
9. Thread Angle:- This is the angle included between the flanks of the thread, measured in an axial plane.

Forms of Threads :- Bureau of Indian Standard (BIS) adopts ISO (International Organization for Standard) metric threads which are adopted by a number of countries apart from India. The design profiles of external & internal threads are shown in Fig. The following are the relations between the various parameters marked in the figure.



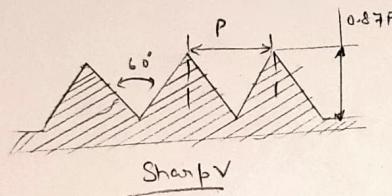
other forms of threads! Apart from ISO metric screw thread profile, there are other profiles in use to meet various application. These profiles are shown in Fig. the characteristics & applications of which are discussed below:

- 1) V-thread (Sharp) :- This thread profile has a larger contact area, providing more frictional resistance to motion. Hence, it is used where effective positioning is required. It is also used in brass pipe work.
- 2) British Standard Whitworth (BSW) Thread :- This thread form is adopted by Britain in inch units. The has round ends, making it less liable to damage than V shape.
- 3) BUTTSERS Thread :- This thread is a combination of V-sharp thread. It exhibits the advantages of square thread, like the ability to transmit power & low frictional resistance, with the strength of the V-thread. It is used where power transmission takes place in one direction only such as screw press, quick acting carpenter's vice, etc.

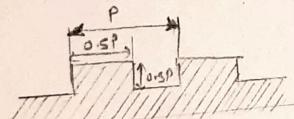
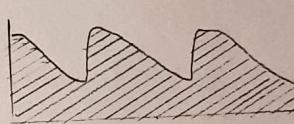
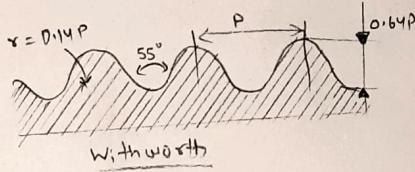
4) Square threads:- Square thread is an ideal thread form for power transmission, In this, as the thread flank is at right angle to the axis, The normal force between the threads acts parallel to the axis, with zero radial components. This enables the nut to transmit very high pressures, as in the case of a screw jack & other similar applications.

5) ACME Threads:- It is a modified form of a square thread. It is much stronger than square thread because of the wider base & it is easy to cut. The inclined sides of the thread facilities quick & easy engagement & disengagement as for example, the split nut with the lead screw of a lathe.

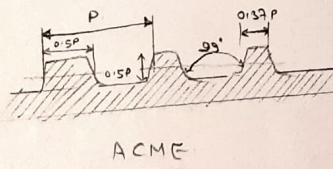
6) Worm thread:- Worm thread is similar to the ACME thread, but is deeper. It is used on shaft to carry power to worm wheels.



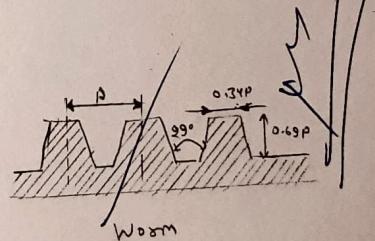
Sharp V



Square



ACME



Worm