



RRB ALP Engineering Drawing Study Plan 2018

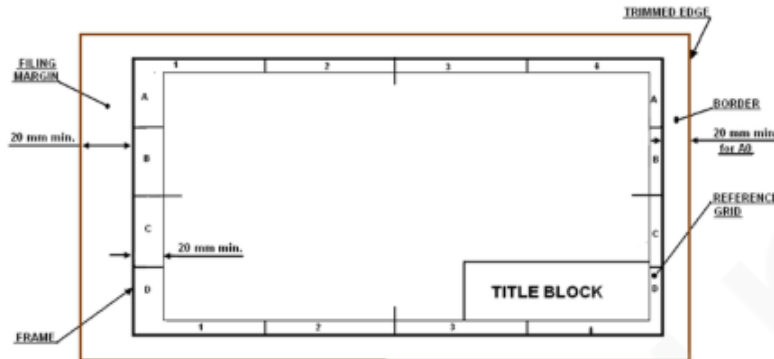


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Layout of a drawing sheet

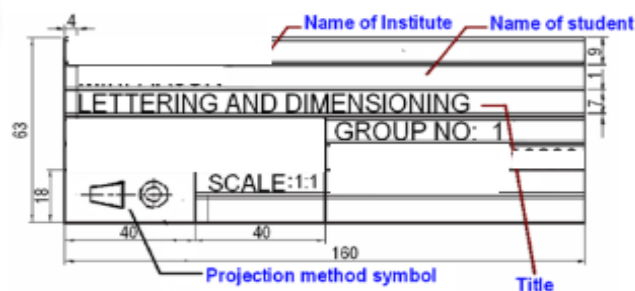
Every drawing sheet is to follow a particular layout. As a standard practice sufficient margins are to be provided on all sides of the drawing sheet. The drawing sheet should have drawing space and title page. A typical layout of a drawing sheet is shown in the figure below:



- Borders – A minimum of 10 mm space left all around in between the trimmed edges of the sheet.
- Filing margin – Minimum 20 mm space left on the left hand side with border included. This provided for taking perforations .
- Grid reference system – This is provided on all sizes of industrial drawing sheets for easy location of drawing within the frame. The length and the width of the frames are divided into even number of divisions and labeled using numerals or capital letters. Number of divisions for a particular sheet depends on complexity of the drawing. The grids along the horizontal edges are labeled in numerals where as grids along vertical edges are labeled using capital letters. The length of each grids can be between 25 mm and 75 mm. Numbering and lettering start from the corner of the sheet opposite to the title box and are repeated on the opposite sides. they are written upright. Repetition of letters or numbers like AA, BB, etc., if they exceed that of the alphabets. For first year engineering students grid references need not be followed.
- Title box – An important feature on every drawing sheet. This is located at the bottom right hand corner of every sheet and provides the technical and administrative details of the drawing. The title box is divided into two zones
 - a. Identification zone : In this zone the details like the identification number or part number, Title of the drawing, legal owner of the drawing, etc. are to be mentioned.
 - b. Additional information zone : Here indicative items lime symbols indicting the system of projection, scale used, etc., the technical items lime method of surface texture, tolerances, etc. & other administrative items are to be mentioned.

Layout of the title box recommended for Engineering Drawing Course

The title box shown in figure can be used for the engineering Drawing Course.



Lettering

Lettering is used for writing of titles, sub-titles, dimensions, scales and other details on a drawing. Typical lettering features used for engineering drawing is shown in figure 3. The following rules are to be followed in lettering. The letter sizes generally recommended for various items are shown in Table 1.

- Essential features of lettering – legibility, uniformity, ease, rapidity, and suitability for microfilming/photocopying/any other photographic processes
- No ornamental and embellishing style of letter
- Plain letters and numerals which are clearly distinguishable from each other in order to avoid any confusion even in case of slight mutilations

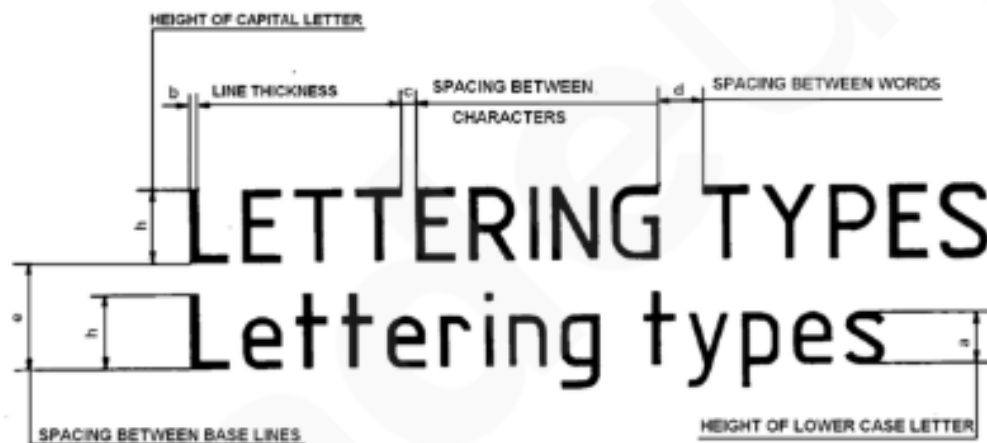
The Indian standard followed for lettering is BIS: 9609

- 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

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

Below given figure indicates the specifications for Type A and Type B letters.




Heights of Letters and Numerals

1. Height of the capital letters is equal to the height of the numerals used in dimensioning
2. Height of letters and numerals – different for different purposes

Check the below given table, for 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



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Check the below given table, Specifications of A -Type Lettering

Specifications	Value	Size (mm)						
Capital letter height	h	2.5	3.5	5	7	10	14	20
Lowercase letter height	$a = (5/7)h$	-	2.5	3.5	5	7	10	14
Thickness of lines	$b = (1/14)h$	0.18	0.25	0.35	0.5	0.7	1	1.4
Spacing between characters	$c = (1/7)h$	0.35	0.5	0.7	1	1.4	2	2.8
Min. spacing b/n words	$d = (3/7)h$	1.05	1.5	2.1	3	4.2	6	8.4
Min. spacing b/n baselines	$e = (10/7)h$	3.5	5	7	10	14	20	28

Check the below given table for Specifications of B -Type Lettering

Specifications	Value	Size (mm)						
Capital letter height	h	2.5	3.5	5	7	10	14	20
Lowercase letter height	$a = (7/10)h$	-	2.5	3.5	5	7	10	14
Thickness of lines	$b = (1/10)h$	0.25	0.35	0.5	0.7	1	1.4	2
Spacing between characters	$c = (1/5)h$	0.5	0.7	1	1.4	2	2.8	4
Min. spacing b/n words	$d = (3/5)h$	1.5	2.1	3	4.2	6	8.4	12
Min. spacing b/n baselines	$e = (7/5)h$	3.5	5	7	10	14	20	28


How to begin your drawing?

To start with the preparation of a drawing the procedure mentioned below may be followed:

- Clean the drawing board and all the drawing instruments using duster.
- Fix the drawing sheet on the drawing board.
- Fix the mini-drafter in a convenient position.
- Draw border lines using HB pencil..
- Complete the title box using HB pencil .
- Plan spacing of drawings b/n two problems/views beforehand.
- Print the problem number on the left top and then commence the drawing work.

Keeping the drawing clean is a must

- Never sharpen pencils over drawing.
- Clean pencil point with a soft cloth after sharpening.
- Keep drawing instruments clean.
- Rest hands on drawing instruments as much as possible – to avoid smearing the graphite on the drawing.
- When darkening lines – try to work from the top of the drawing to the bottom, and from left to the right across the drawing.
- Use brush to remove eraser particles. Never use hands.
- Always use appropriate drawing pencils.



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Engineering Curves

A circle is formed when the cutting plane makes an angle of 90 with the axis of the cone and is parallel to the base, cutting all generators of the cone

- An ellipse is formed, when the cutting plane is inclined to the axis at an angle 'α' and cuts all the generator of the cone
- If the asymptotes are perpendicular to each other then the hyperbola is called rectangular hyperbola or equilateral hyperbola. In case of rectangular hyperbola, the product of distances of any point on the curve from the asymptotes is always constant.

Plane Curve: Curve traced by a point which moves in a constantly changing direction on a plane surface.

Space Curve: Curve traced by a point which moves in a constantly changing direction in space.

- Cycloidal is a curve generated by a point on the circumference of a circle which rolls along a straight line without slipping or sliding.
- HYPOCYCLOID- Hypocycloid is a curve traced by a point on the circumference of a circle which rolls without sliding or slipping inside another circle.
- An involute is a curve traced by the free end of a string when unwound itself from a circle or a polygon, the string being always tight. It can also be defined as a single-curved line traced by a point on a straight line when it rolls tangentially along a circle or a polygon without slipping.
- Archimedean spiral: It is the locus of point traced when a point is moving uniformly along a straight line towards or away from the pole while the straight line revolve about pole with uniform angular velocity. That is, when the linear motion of the point and the rotary motion of the line is uniform, then Archimedean spiral exist.

1. Archimede's spiral inverts to hyperbolic spiral

2. Fermat's spiral inverts to Lituus spiral

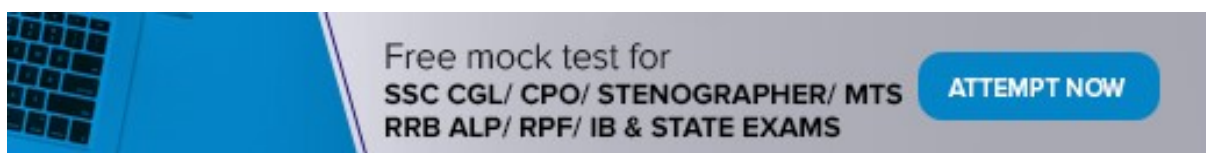
- Golden ratio: Two quantities are in golden ratio if their ratio is same as ratio of their sum to the larger of the two quantity. It is also called golden mean or golden section or extreme and mean ratio or divine proportion or divine section.

Mathematically,

$$\frac{a+b}{a} = \frac{a}{b} = \phi$$

- Cylindrical Helix, simply known as Helix –Conical helix construction is similar to cylindrical helix. The difference is that each point is constructed on a different radius. It is generated as the point moves on the surface of a cylinder such that it moves round the axis and simultaneously moves towards vertex.
- Conical Helix – Conical helix construction is similar to cylindrical helix. The difference is that each point is constructed on a different radius. It is generated as the point moves on the surface of a cone such that it moves around the axis and simultaneously moves towards vertex.
- The locus traced by a point in such a way that the sum of its distances from two fixed points is always constant is called an ellipse.
- The eccentricity of parabola is less than the eccentricity of a hyperbola. The ratio of the distance of a point on a conic from the focus to the distance of the point from the directory is known as Eccentricity
- Boyle's law, $PV = \text{constant}$ generates a curve which is a rectangular hyperbola.

- The line joining any point on an Archimedean spiral with the pole is called the radius vector.
- If the generating point is on the generating circle and the generating circle is outside the directing circle, the curve obtained is Epicycloid.
- A gear tooth profile is in the form of Involute.
- The sum of distances of any point on the ellipse from the foci is equal to major axis.
- The curve traced out by a point moving in a plane such that the difference between its distances from two fixed points is constant is known as Hyperbola.



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