1. Traditional sections views are based on the use of an imaginary cutting plane that cuts through the object to reveal interior features. Mechanical assemblies are sectioned to assist in the assembly of components and for visualization. Cutaway drawings of roads are used in civil engineering.

The use of sectioned technical illustrations is a common practice to describe interior features of complicated assemblies. Normally, hidden lines are omitted from section views. Adding hidden lines to a section view complicates the drawing, defeating the purpose of clarifying with a section. A minimum number of hidden lines are sometimes needed to represent features other than the primary one shown by the section. This is done if it eliminates the need for another view.

Visible surfaces and edges representing changes of planes that are behind the cutting plane are drawn in a section view. Section lined areas are bounded by visible lines and never by hidden lines, because the bounding lines are visible in the section view. A 3-D CAD model can be sectioned by positioning a reference plane relative to the object and partitioning the object to produce a section view.

2. Principles of Dimensioning

RULES for the use of the dimension form.

1. All dimension, extension, and leader lines should be thin, sharp, dark lines (.5mm/2H).

2. Extension lines indicate the points between which the dimension figures apply. They are drawn perpendicular to the dimension lines, start with a visible gap (~1/32") between them and the object, and terminate 1/8" (3.2 mm) beyond the last arrowhead.

3. Each dimension should be terminated by arrowheads touching the extension lines and pointing in opposite directions. Arrowheads are drawn freehand with .7mm/HB lead. The line should be broken only at the approximate center for the dimension figures.

4. Dimensions shown with dimension lines and arrowheads should be placed to be read from the bottom of the drawing (unidirectional system).

5. All dimensions should be given in decimal format. When dimensions are given in inches, leading zeros are omitted from dimension values less than 1.00

6. When all dimensions on a drawing are given in inches, the inch marks (") are omitted, the same applies to millimeters. If metric units are used, the word METRIC will appear boxed in a spot toward the lower portion of the drawing sheet.

7. A dimension line should never coincide with an object line or a center line, nor should it be an extension of these lines. Both, however, may be used as extension lines.
8. Crossing of extension lines or dimension lines should be avoided if possible. Where such crossings are unavoidable, there should be no break in either of the lines. However, if extension lines cross dimension lines through the arrowheads, the extension line may be broken.
9. Dimensions should be at least 3/8" (10 mm) from the object outline, then equally spaced at least 1/4" (6 mm) apart. A continuous series of dimensions should be aligned rather than staggered. Standard practice is to place the shortest dimensions nearest to the object and space adjacent parallel dimension lines further away from the object in order of their length.
10. Dimensions are preferably placed outside the outlines of the views. (See rule #11)
11. When placement outside the views will result in (a) dimensions too far from the distance they indicate, (b) long and confusing extension lines or leader lines that cross other lines of the drawing, or (c) any confusion in understanding where the dimension applies, they may be placed inside the view and clos**e** to the distance they indicate.

3. Half-Sections

A half-section is a view of an object showing one-half of the view in section. The diagonal lines on the section drawing are used to indicate the area that has been theoretically cut. These lines are called section lining or cross-hatching. The lines are thin and are usually drawn at a 45-degree angle to the major outline of the object. Half Section is used to the exterior and interior of the part in the same view. The cutting-plane line cuts halfway through the part and removes one quarter of the material and the line that separates the different types (interior and exterior) may be a centerline or a visible line.

The spacing between lines should be uniform. A second, rarer, use of cross-hatching is to indicate the material of the object. One form of cross-hatching may be used for cast iron, another for bronze and so **on.**

Full Section

If the imaginary cutting plane passes through the entire object, splitting the drawn object in two with the interior of the object revealed, this is called a "full section." A full section is the most widely-used sectional view. The section-lined areas are those portions that have been in actual contact with the cutting-plane.

4. Leader lines are thin, solid lines that terminate in an arrowhead or dot.

Arrowheads are used when leader lines terminate at the outline of an object.

Dots are used when leader lines terminate within the outline of the object or on the surface of the object.

Tick is also used to terminate leader lines

5. Scale 5:1: This is used when scaling up. It means whatever is to be drawn is to be 5 times the original size. A 50mm line is to be drawn at a scale of 5:1 (i.e 5 times more than its original size). The measurement 50mm is multiplied by 5 to give 250mm. A 250mm line is drawn.

Scale 1:10: This scale is used when scaling down. It means the drawing to be made has to be the size of the original drawing dimension divided by 10. A 500mm line is to be drawn at a scale of 1:10 (i.e 10 times less than its original size). The measurement 500mm is divided by 10 to give 5mm. A 5mm line is drawn.

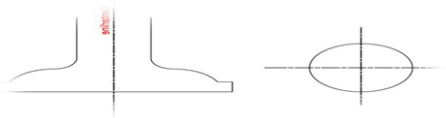
6. Shape Identification Symbols

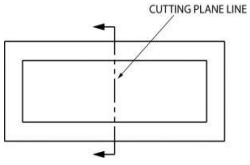
a. Diameter: ⌀

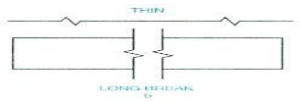
b. Radius: R

c. Square: 

d. Spherical Radius: SR

e. Center Line: 

f. Cutting plane line: 

g. Long break: 

7. Elements to Be Considered While Making Projection

- *Object to be projected*
- *Observers' eye or station point*
- *The plane of projection or picture plane*
- *Rays or lines of sight or projectors*

Orthographic Projections

The word ortho means right-angle and orthographic means right angled drawing. Orthographic projection is a geometric method of projection obtained on the plane of projection when the projectors are parallel to each other and perpendicular to the plane of projection. Here, the number of planes of projections may be one or more. The further subdivisions of orthographic projections are:

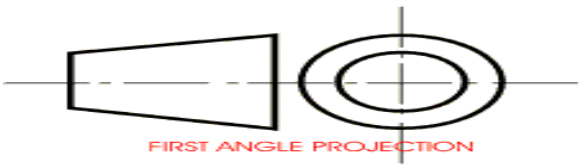
Multiview projections

Axonometric projections

8. A projection of an object is referred to as an orthographic projection when noticed that the line of sight (also referred to as the projection line) is perpendicular to the projection plane. This relationship must exist for the projection to be an orthographic projection.

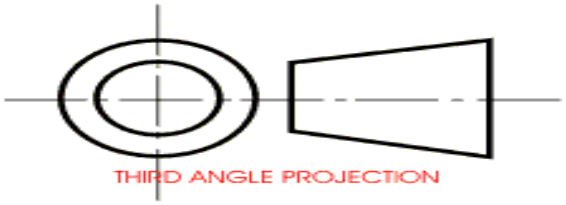
9. FIRST ANGLE PROJECTION

First angle projection is a method of creating a 2D drawing of a 3D object. It is mainly used in Europe and Asia and has not been officially used in Australia for many years. In Australia, third angle projection is the preferred method of orthographic projection. The correct method of presenting the three views, in first angle orthographic projection is explained below. The drawing is composed of a front, side and plan view of an object. The first drawing is the front view (drawn looking straight at the front of the shape), the second is a drawing of the shape seen from the side (known as side view) and last of all a drawing from above known as a plan view. Each view should be in line, level and the same size.



THIRD ANGLE PROJECTION

Third angle projection is a method of creating a 2D drawing of a 3D object. In third angle, the object is placed in the third quadrant. This means that the plane of projection is between the observer and the object. Third angle projection is used in Australia and United States as a default projection system for industrial designs for product fabrication. When using third angle projection to compile a diagram of the three views, we first draw the most prevalent side of the object as the front view. The top view is positioned directly above the front view and for the side view, we generally position the right side view on the right of the front view. (If the left side is used, it is positioned on the left side.) The respective views are thus placed in their prescribed positions. It is particularly important to note that the top view is to be placed above the front view.



Objectives

1. To project the auxiliary view, an imaginary plane known as …….
   a) Reference Plane
   b) Principle plane
   c) Normal plane
   d) Inclined plane
2. Reference plane is parallel to the direction of view
   a) True
   b) False
3. Dimension of one side of the inclined surface can be……projected on the reference plane
   a) Indirectly
   b) Equally
   c) Directly
   d) Normally
4. In isometric projection the three edges of an object are inclined to each other at

(a) 60º (b) 120º (c) 100º (d) 90º

5. The angle between the flanks of a metric thread is

(a) 60º (b) 90º (c) 75º (d) 55º

6. Which one among the following represents a permanent fastener

a) Nut b) Rivet c) Screw d) Bolt

7. The convexity provided on the rim of the solid web cast iron pulley is called

a) Bending b) Curving c) Crowning d) Riveting

8. Section lines are generally inclined with the base, at an angle of

a) 30º b)45º c)60º d)90º

9. The isometric view of a sphere is always

a) a circle b) an ellipse c) a Parabola d) a Semicircle

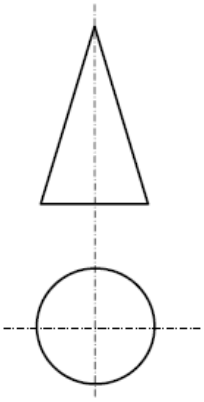
10. In isometric projection, the four center method is used to construct

a) an ellipse b) a square c) a triangle d) a rectangle

11 Cylinder (C)

12 Cone(A)

(v) With respect to the front view and top view given below, name the solid



(a) Cone
(b) Cylinder
(c) Cube
(d) Frustum

13. A footstep bearing is a

a) journal bearing b) thrust bearing c) pivot bearing d) pedestal bearing

14. The angle between the flanks of B.S.W. thread is

a) 60^o b) 65^o c) 55^o d)75^o

15. Top view is projected on the

a) Vertical Plane b) Corner Plane c) Side Plane d) Horizontal Plane