Chapter 20

ORTHOGRAPHIC READING AND CONVERSION OF VIEWS

20-1. INTRODUCTION

Orthographic reading is the ability to visualize the shape of an object from its drawing in orthographic views. Every engineer or technician connected with the work of construction should possess this ability. Without it, it would be difficult for him to execute, independently, any work according to a given drawing.

An engineering drawing is not read aloud. It is read mentally. The whole drawing cannot be read or interpreted at a glance. It should be read systematically and patiently. The easiest way to learn reading such a drawing is to learn how to prepare one.

However, it is not impossible to know how to read it without learning how to draw. In either case, a sound knowledge of the principles of orthographic projection is quite essential for reading the drawing without hesitation.

We studied in chapter 8 that *in orthographic projection, any one view shows only two dimensions of a three dimensioned object. Hence, it is impossible to visualize the shape of the object from a single view. The second view shows the third dimension. Thus, at least two views are necessary to determine its shape.* Sometimes, a third view is also necessary to completely visualize an object.

20-2. READING OF ORTHOGRAPHIC VIEWS (BLUE-PRINT READING)

Every object may be imagined as consisting of a number of components having forms of simple solids such as prisms, cylinders, cones, etc. with some additions or subtractions or both. The additions may be in the form of projections, while the subtractions may be in the form of holes, grooves, cavities, etc. It is not possible to determine from only one view whether there is an addition or subtraction. The other view or views must be referred to.

For example in fig. 20-1(i), the meaning of lines *AB* and *CD* can be determined only after referring to the other view. They might represent a projection as shown in figs. 20-1(ii) and (iii) or a cavity as shown in figs. 20-1(iv) and (v) or a cavity made by projections as shown in fig. 20-1(vi).

Note that one *front-view* represents six different types of objects whose *top-view* are different as shown in fig. 20-1.

20-8. ILLUSTRATIVE PROBLEMS

This book is accompanied by a computer CD, which contains an audiovisual animation presented for better visualization and understanding of the subject. Readers are requested to refer Presentation module 49 for the following problem.

Problem 20-8 [fig. 20-27(i)]. *A pictorial view of bearing block is shown in fig. 20-27(i). Draw the front view, left-hand side view and top view according to the First-Angle projection method.*

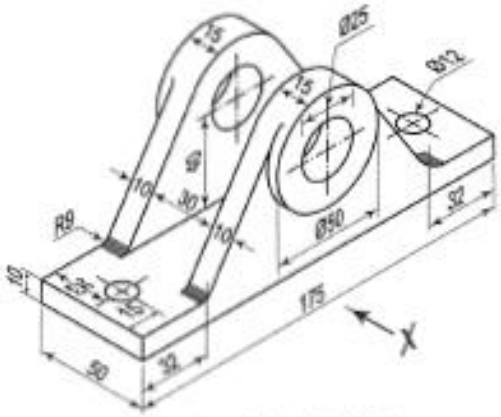


FIG. 20-27(i)

The procedure of preparing the orthographic views is illustrated in the following steps:

Step 1 [fig. 20-27(ii)]:

(i) Take a half imperial size drawing paper of 560 mm × 380 mm.

(ii) Draw the border lines taking A = 30 mm and B = 10 mm as shown in fig. 20-27(ii).

Now clear space in the drawing paper is 520 mm × 360 mm.

(iii) The scale of drawing is decided from the size of object and number of views required to draw. Let L, W and H be the length, width and height of the object. The spacing between two views can be calculated as under:

Views	Horizontal distance (E)	Vertical distance (F)
(a) ***For four views*** (front view, top view and two side views):	$E = \frac{520 - (L + 2W)}{4}$ mm	$F = \frac{360 - (H + W)}{3}$ mm
(b) ***For three views*** (front view, top view and side view):	$E = \frac{520 - (L + W)}{3}$ mm	$F = \frac{360 - (H + W)}{3}$ mm

If these distances E and F are less than 20 mm, adopt the suitable standard scale. In the above illustrated problem E and F are 95 mm and 75 mm respectively.

Select suitable scale approximately and draw required blocks depending upon the number of views (three in this problem).

Step 2 [fig. 20-27(iii)]:

(i) Mark centres for circles.

(ii) Draw centre lines passing through these centres and extend in other views also.

Step 3 [fig. 20-27(iv)]:

(i) Draw circle of required diameter in the front view as well as in the top view.

(ii) Draw the other lines in the front view and project them in the side view as well as in the top view.

(iii) Erase construction lines. Refer fig. 20-27(iv).

Step 4 [fig. 20-27(v)]:

(i) Clean the drawing paper. Fair first circles. Complete the views by fairing various lines. The thickness of different types of lines should be as suggested in fig. 3-1, table 3-2 and table 3-3. The lines should be clean, dense and uniform.

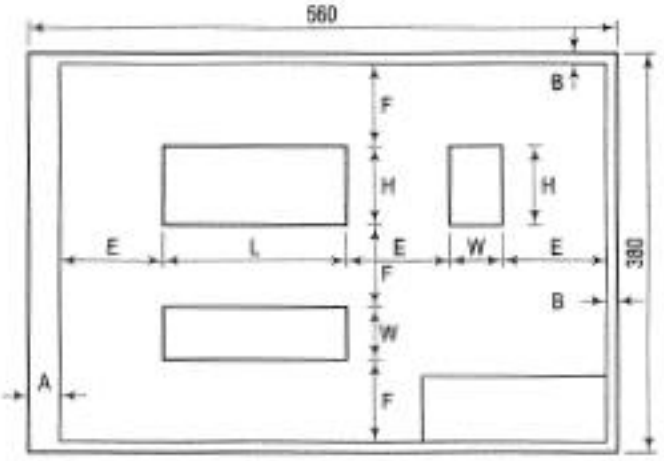


FIG. 20-27(ii)

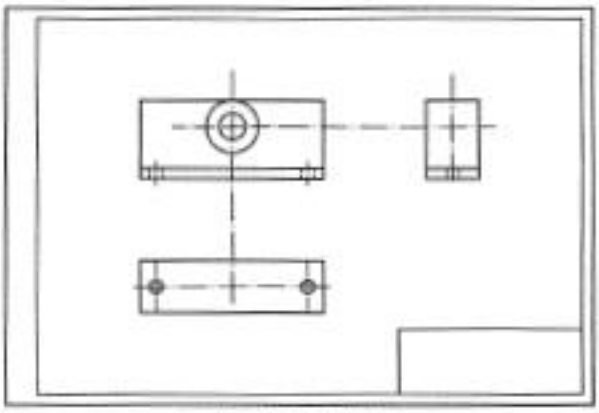


FIG. 20-27(iii)

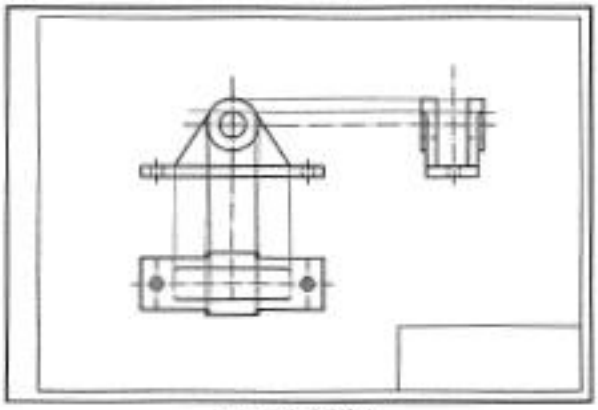


FIG. 20-27(iv)

(ii) Draw extension lines.

(iii) Draw dimension lines. Insert dimensions. Observe that the height of numerals should not be more than 3 mm. It should be written freehand. Aligned method of writing dimensions is recommended. Follow IS:11669 (1986) for dimensioning.

(iv) Complete title block by specifying unit of dimensions, symbol for method of projection and scale adopted.

(v) Fair boundary lines by 2H pencil.

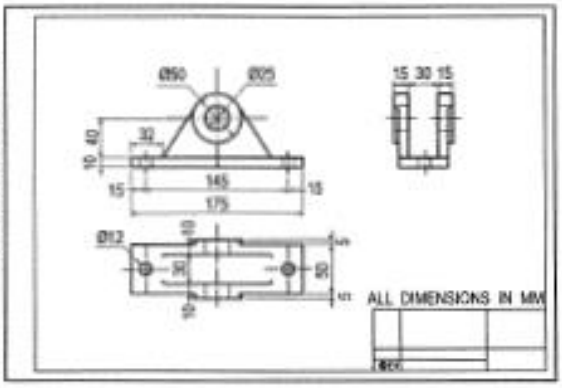


FIG. 20-27(v)

Problem 20-9. *Draw the front view and a side view of the wedge-shaped piece shown in pictorial view in fig. 20-28(i).*

The edge *AB* is parallel to the isometric axis *oz* and hence, it will be seen as a horizontal line in the front view [fig. 20-28(ii)]. The edge *CD* will be seen as an inclined line.

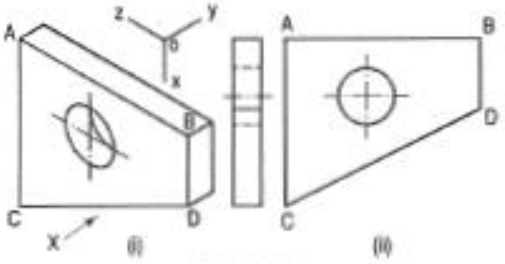


FIG. 20-28

Problem 20-10. *Draw the front view and a side view of the wedge-shaped piece shown pictorially in fig. 20-29(i).*

It can be seen from the shape of the circular hole that the pictorial view is drawn according to *oblique projection*. Hence, the front view [fig. 20-29(ii)] will be similar to the front face shown in the pictorial view.

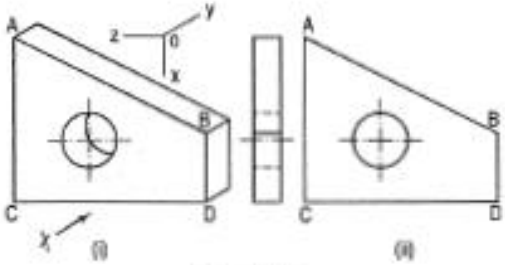


FIG. 20-29

It is interesting to note that the two pictorial views [figs. 20-28(i) and 20-29(i)] look very much similar. But from their orthographic views we find that in fig. 20-29, the piece is in an inverted (upside-down) position.

Problem 20-11. *Draw the front view and a side view of the wedge-shaped piece shown pictorially in fig. 20-30(i).*

See fig. 20-30(ii). Note that the bottom edge is horizontal.

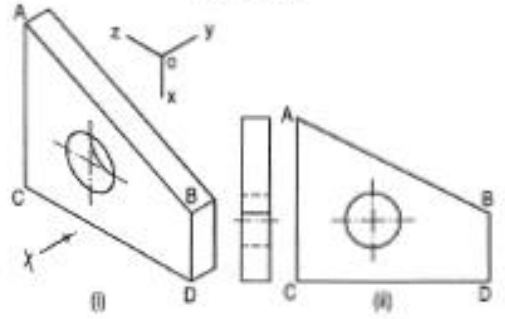


FIG. 20-30

Note: The three axes are shown along with the pictorial views, only for the purpose of explanation of the above problems No. 20-9, 20-10 and 20-11.

Problem 20-12. *Draw the following views of the object shown pictorially in fig. 20-31(i). (i) Front view. (ii) Top view. (iii) Side view from the right.*

See fig. 20-31(ii).

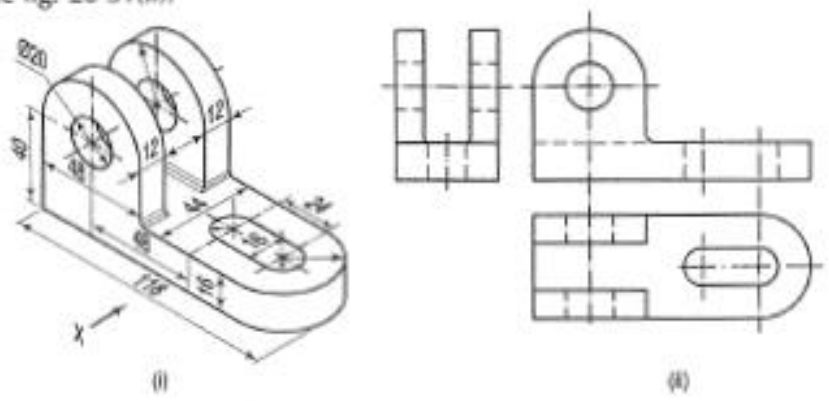


FIG. 20-31

Problem 20-13. *Draw the following views of the block shown pictorially in fig. 20-32(i). Use third-angle projection method. (i) Front view. (ii) Top view. (iii) Both side views.*

See fig. 20-32(ii).

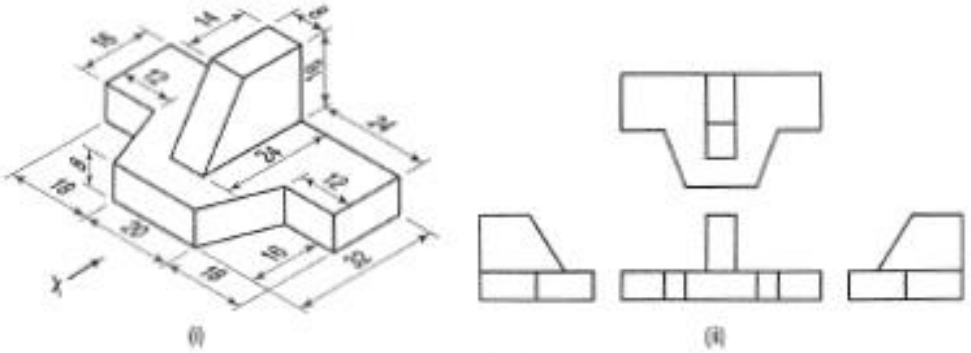


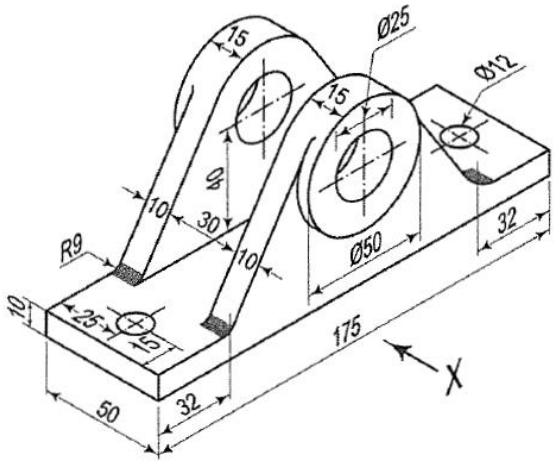
FIG. 20-32

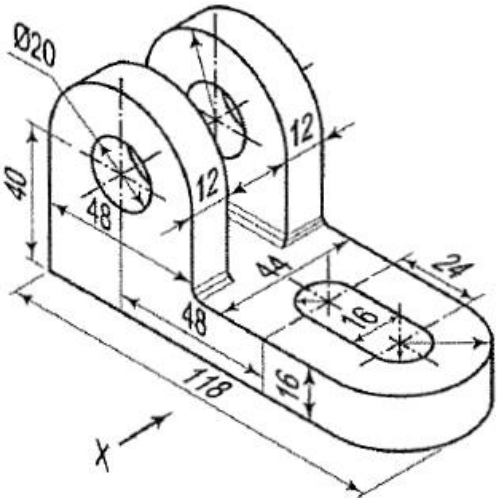
EXERCISES 20

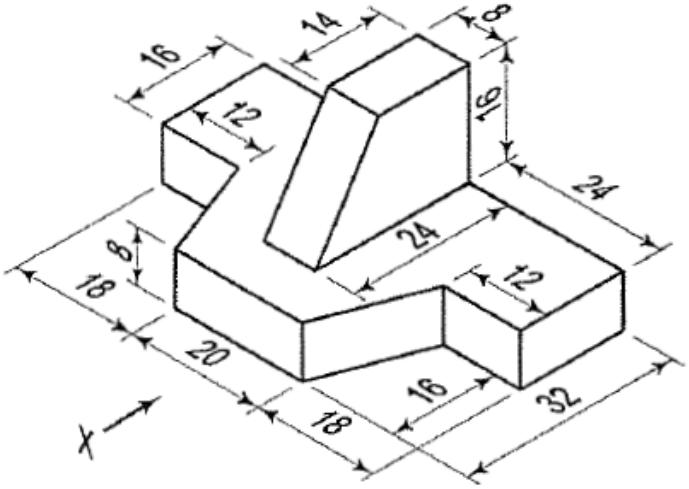
Pictorial views of objects are shown in fig. 20-33 to fig. 20-70. Draw, scale full size, views of each object as stated below. The front view in each case, should be drawn as seen in the direction of the arrow *X*. Unless otherwise specified, use first-angle projection method. Insert all dimensions in the views.

Solve each exercise independently and then, compare your answer with the given solution.

Practice figures for Orthographic Projection.







Practice figures for Orthographic Projection.