

Fundamentals of Drafting - Isometric Projection

Objectives:



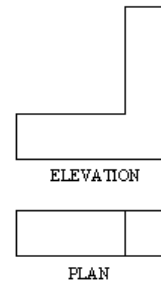
1. To identify common forms of pictorial projection.
2. To distinguish between isometric projection and isometric drawing.
3. To illustrate the principle of isometric drawing for rectilinear objects and curved objects.
4. To draw isometric views from given orthographic projection drawings.

Pictorial projection

A pictorial projection is a method of producing a two-dimensional view of a three-dimensional object that shows the three main faces indicating the height, width and depth simultaneously.

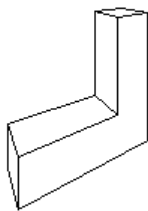
Example

The object in Orthographic Projection

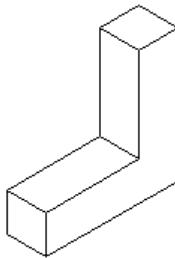


Common forms of pictorial projection

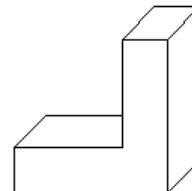
i) perspective projection



ii) isometric projection



iii) oblique projection

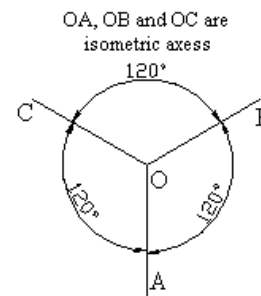


General rules in drawing pictorial projection

- i) suitable only for relatively simple objects
- ii) hidden lines are omitted, unless they are necessary
- iii) centre lines are omitted, unless required for dimensioning

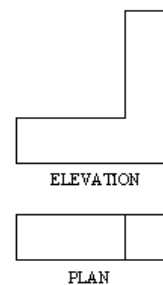
Defining isometric projection

Isometric projection is a method of producing a pictorial view of an object. The projected view is based on three basic equipaced axes known as isometric axes. The angles between the isometric axes, therefore, must be 120 degrees.

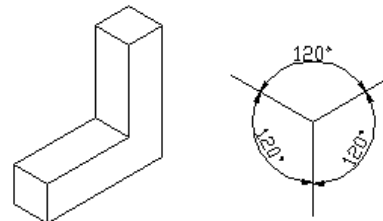


Example

The object in Orthographic Projection



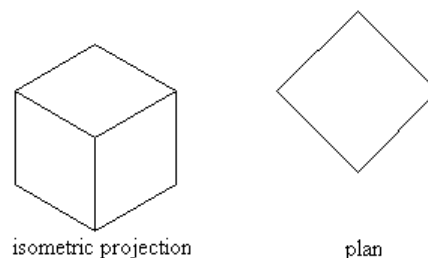
i) the projected view



ii) matching the projected view with the isometric axes

Isometric projection vs isometric drawing

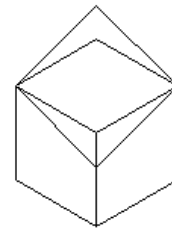
Comparing the top surface of a cube drawn in isometric projection and the corresponding plan view



When these two views are put together, it is found that:

- i) the edges of the cube in isometric projection are equally foreshortened, or
- ii) the edges will be larger than the cube actually is if the isometric projection is made using the true lengths

To obtain a full size view, a scale must be used. This scale is called isometric scale.



To distinguish whether the isometric scale is used in the projection, it is categorised into:

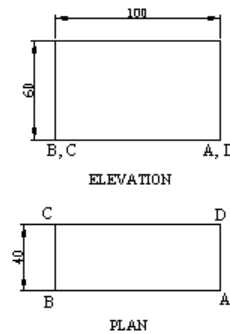
- i) **Isometric projection** a view is drawn using the isometric scale
- ii) **Isometric drawing** a view is drawn using the natural scale

In practice, isometric scale is seldom used. An isometric drawing using the natural scale will be correctly proportioned and its simplicity in construction offsets its disadvantage of being oversized.

Positioning of view

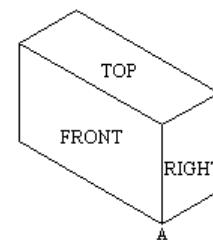
An isometric drawing can be drawn differently according to how the object is being positioned.

Consider a rectangular block. The four bottom corners of the block are marked with **A**, **B**, **C** and **D** respectively.

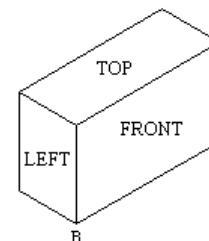


When making an isometric drawing, it is important to note how the object is positioned. Taking the rectangular block as an example, **four possible positions** can be made.

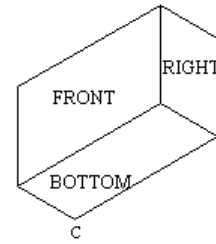
- i) Corner **A** is the lowest point of the isometric drawing



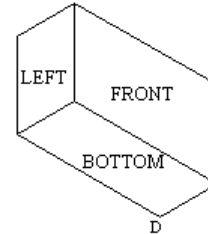
- ii) Corner **B** is the lowest point of the isometric drawing



iii) Corner C is the lowest point of the isometric drawing

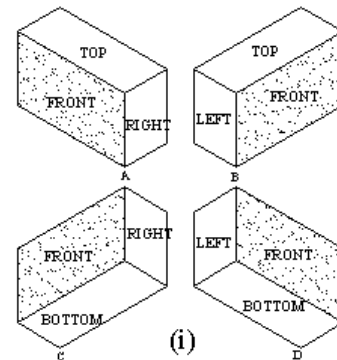


iv) Corner D is the lowest point of the isometric drawing

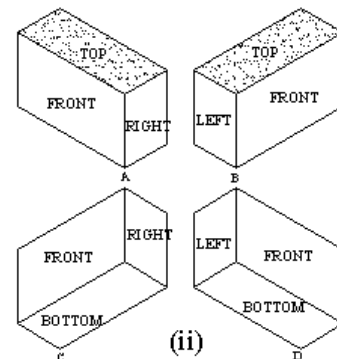


Comparing the four possible positions, the visible faces of the rectangular block are:

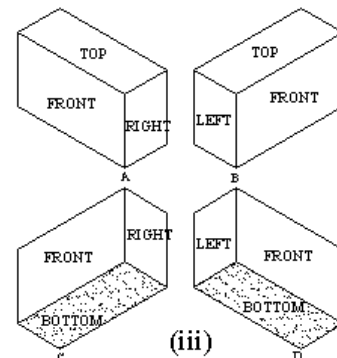
i) the front face is always visible in all possible positions



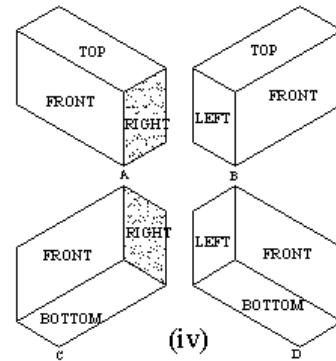
ii) when the lowest point is near to the observer (Corner A or Corner B), the top face is visible



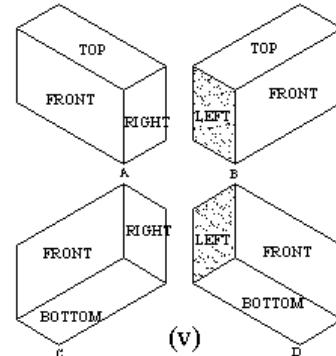
iii) when the lowest point is far away from the observer (Corner C or Corner D), the bottom face is visible



- iv) the right face is visible when the lowest point is on the right near the observer (**Corner A**) or the lowest point is away from the observer on the left (**Corner C**)



- v) the left face is visible when the lowest point is on the left near the observer (**Corner B**) or the lowest point is away from the observer on the right (**Corner D**)



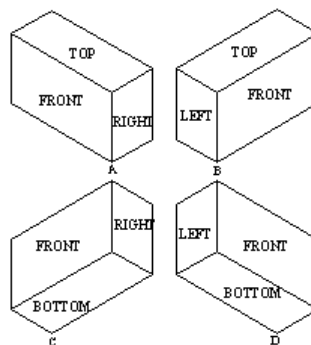
Basic drawing techniques

Similar to most pictorial projection, the general rules for constructing an isometric drawing are:

- i) suitable only for relatively simple objects
- ii) hidden lines are omitted, unless they are necessary
- iii) centre lines are omitted, unless required for dimensioning

For beginners, it is advisable to follow the steps described below:

- i) visualise the objects
- ii) identify the positioning of the isometric drawing
(remember the 4 possible positions of the rectangular block)



- iii) draw a box into which the object will just fit
- iv) build up the shape of the object inside the box

Drawing techniques

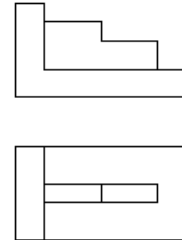
i) objects with isometric lines only

Drawing techniques - isometric lines

Isometric lines can be drawn directly on the isometric view using the measurement in the orthographic views.

Example 1

The object in orthographic projection



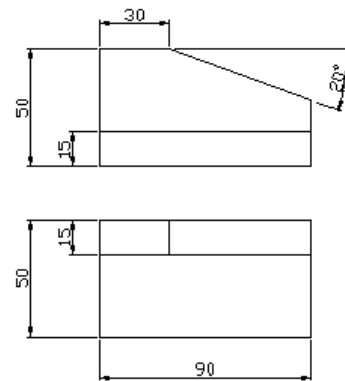
ii) objects with non-isometric lines

Drawing techniques - non-isometric lines

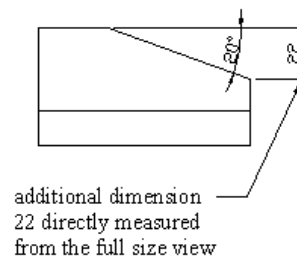
Non-isometric line can be drawn by fixing its end points by ordinates. Angles cannot be laid off directly on an isometric drawing

Example 2

The object in orthographic projection



Constructing the non-isometric line full size and finding the necessary dimensions or ordinates



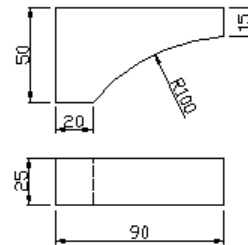
iii) objects with curved profile

Drawing techniques - curved profiles

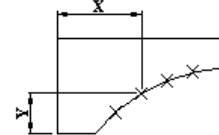
Curved profiles can be constructed by transferring the ordinates of a number of points in the orthographic view to the isometric view.

Example 3

The object in orthographic projection



Constructing the curve profile full size, selecting points on the curve and obtaining ordinates for each of the points



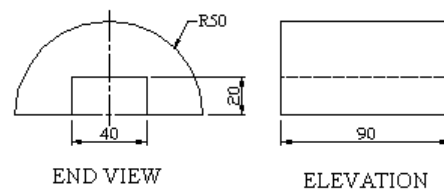
iv) objects with circular features

Drawing techniques - circles

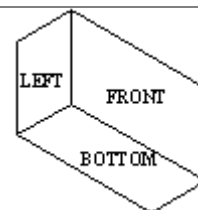
Circles in isometric drawing can be constructed in the same way as curved profiles - construction by ordinates, or using an approximate method.

Example 4

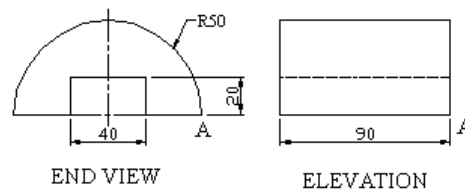
The object in First Angle orthographic projection



Positioning of the block



How do you indicate the lowest point of the isometric drawing in the orthographic view?

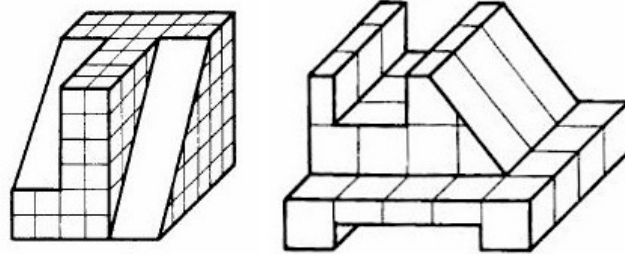


Drawing practice

Textbook
 Pages 21, 22

Question No. 1 (Referring to Figure 4.21 and Figure 4.22)

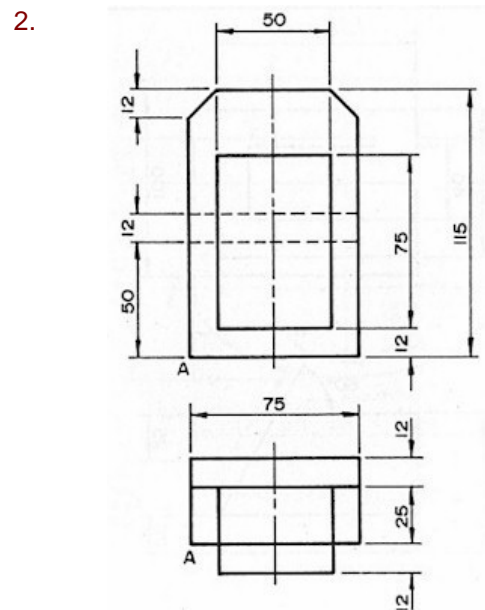
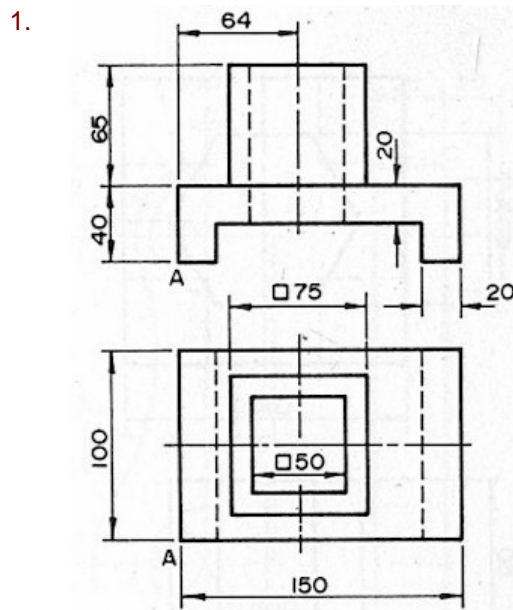
Redraw in isometric drawing the objects shown below (extracted from Figure 4.21 and Figure 4.22), remembering that measurements can be taken only along the basic axes. Each construction square represents a 10 mm measurement.



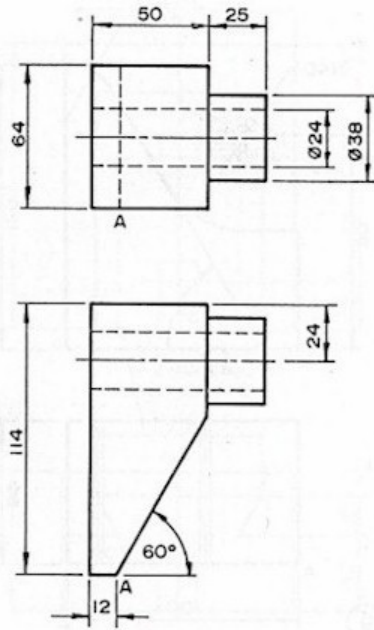
The lowest point of the isometric drawing will also be advised by your tutor.

Assignment 4

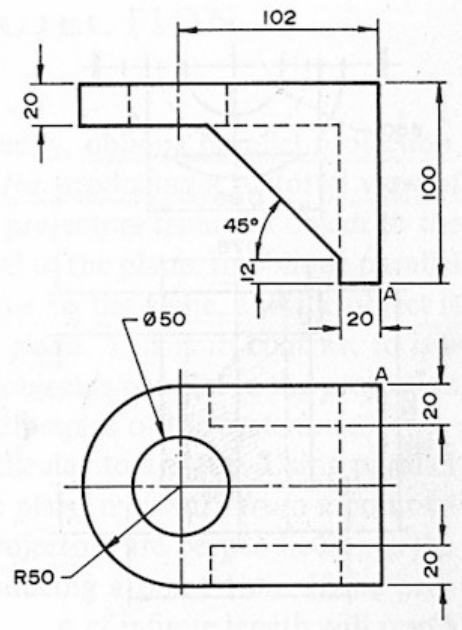
No. 1 - 4 Referring to the objects shown below, Parts 1, 2 and 4 are drawn in First Angle projection while Part 3 is drawn in Third Angle projection. Make isometric drawings of the objects, positioned so that the corner marked A is the lowest point on the drawing.



3.



4.



You may download the assignment sheet from the "ACTION MENU".