Design Drafting Lectures
Lecture 7

Pictorial Drawings: Axonometric Projection

Frequently, it is necessary to prepare drawings for the presentation of a design idea that are accurate and scientifically correct and can be easily understood by persons without technical training. Such drawings show several faces of an object at once, approximately as they appear to the observer. This type of drawing is called a **pictorial drawing**.

Since pictorial drawings show only the appearances of parts or devices, it is not satisfactory for completely describing complex or detailed forms.

Multiview Drawings:

Multiview drawings make it possible to represent accurately the most complex forms of a design by showing a series of exterior views and sections. This type of representation has, however, two limitations:

1. Its execution requires a thorough understanding of the principles of multiview projection

2. Its reading requires a definite exercise of the constructive imagination

Use of Pictorial Drawings:

Various types of pictorial drawings are used extensively in catalos, and in the following:

1. Catalogs
2. Sales literature
3. Patent drawings
4. Piping diagrams
5. Machine design
6. Structural design
7. Architectural design
8. Furniture design

Methods of Projection:

The four principal types of projections are:

1. Multiview (Not a pictorial)
2. Axonometric (Most commonly used)
3. Oblique (Least realistic)
4. Perspective (Most realistic)

Both **multiview and axonometric projections** are considered to be orthographic projection because the observer is at infinity; the visual rays are parallel to each other and perpendicular to the plane of projection.

In **oblique projection**, the observer is considered to be at infinity and the visual rays are parallel to each other but oblique to the plane of projection.

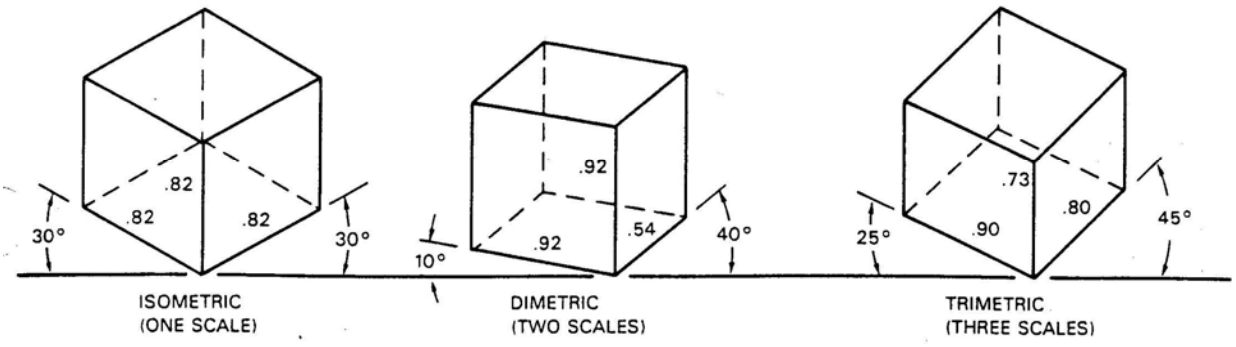
In **perspective** the observer is considered to e at a finite distance from the object and the visual rays extend from the observer's eye to the stations point (SP) to all points of the object from a "cone of rays." The use of vanishing points provides the depth and distortion we se with our eyes.

Types of Axonometric:

The distinguishing feature of axonometric projection, as compared to multiview projection, is the inclined position of the object with respect to the plane of projection. Since the principal edges and surfaces of objects are inclined to the plane of projection, the length of the lines, the sizes of the angles and the general proportions of the object vary with the infinite number of possible positions in which the object may be placed with respect to the plane of projection.

The three types of axonometric projections are known as:

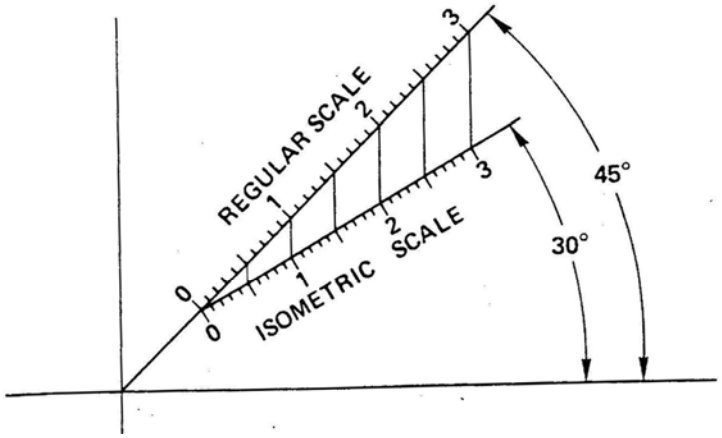
1. Isometric
2. Dimetric
3. Trimetric



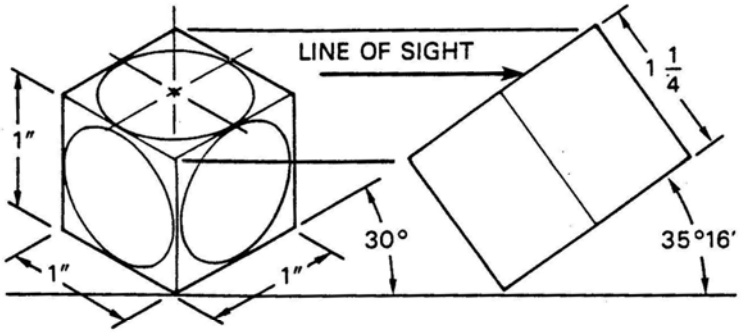
Isometric:

The word isometric means equal (iso) measure (metric). With this kind of drawing, the three principle planes and edges make equal angles with the plane of projection. As isometric projection is achieved by revolving the object 45˚ in the horizontal plane, then tilting it forward such that the imaginary line between the front-top corner to the back-bottom corner is perpendicular to the projection plane. This accounts for the 30˚ angles form the horizontal that makes up an isometric drawing.

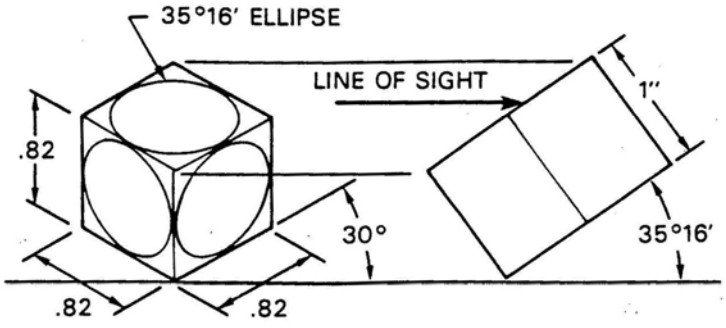
It is customary to consider three edges of the cube that meet at the corner nearest the observer as the **axonometric axes**. In the case of an isometric, these are called **isometric axes**. Any line parallel to one of these three axes is known as an **isometric line**. Any line not parallel to these lines is known as a **non-isometric line** and cannot be drawn to scale.



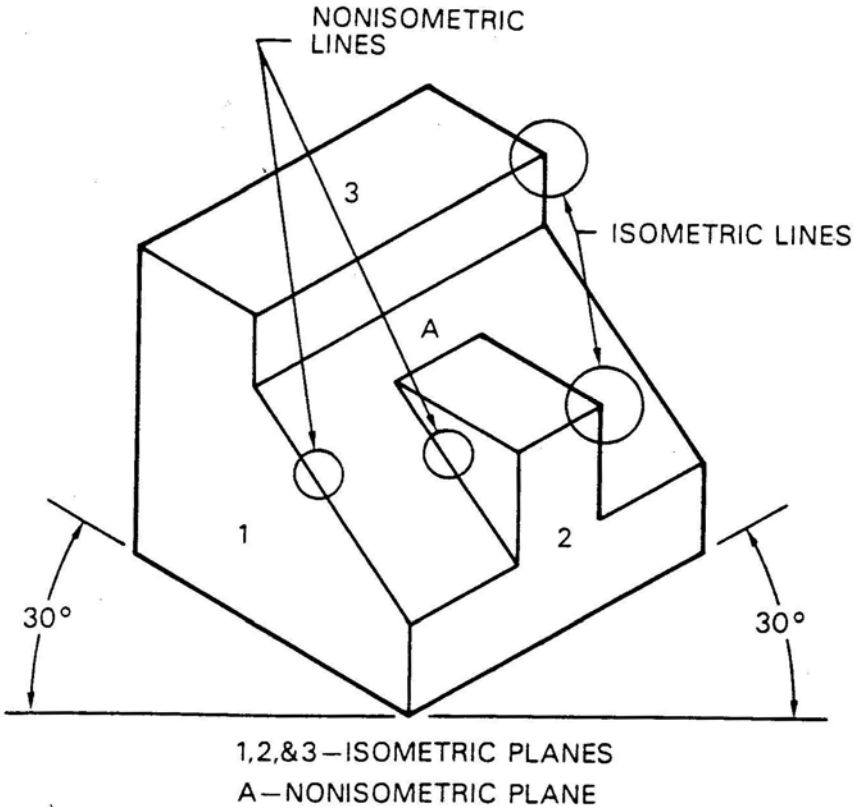
Projection of regular scale to isometric scale



ISOMETRIC DRAWING
BASED ON TRUE MEASUREMENT IN ISOMETRIC VIEW
(PREFERRED METHOD)



ISOMETRIC PROJECTION
BASED ON TRUE MEASUREMENT IN ORTHOGRAPHIC
(SELDOM USED)



Isometric and non-isometric planes

Isometric Scale:

It is possible to purchase or create an isometric scale that can be used to measure the receding lines that make up an isometric drawing. This way, the drawing will be a true representation of an object rotated and tilted in the manner I described.

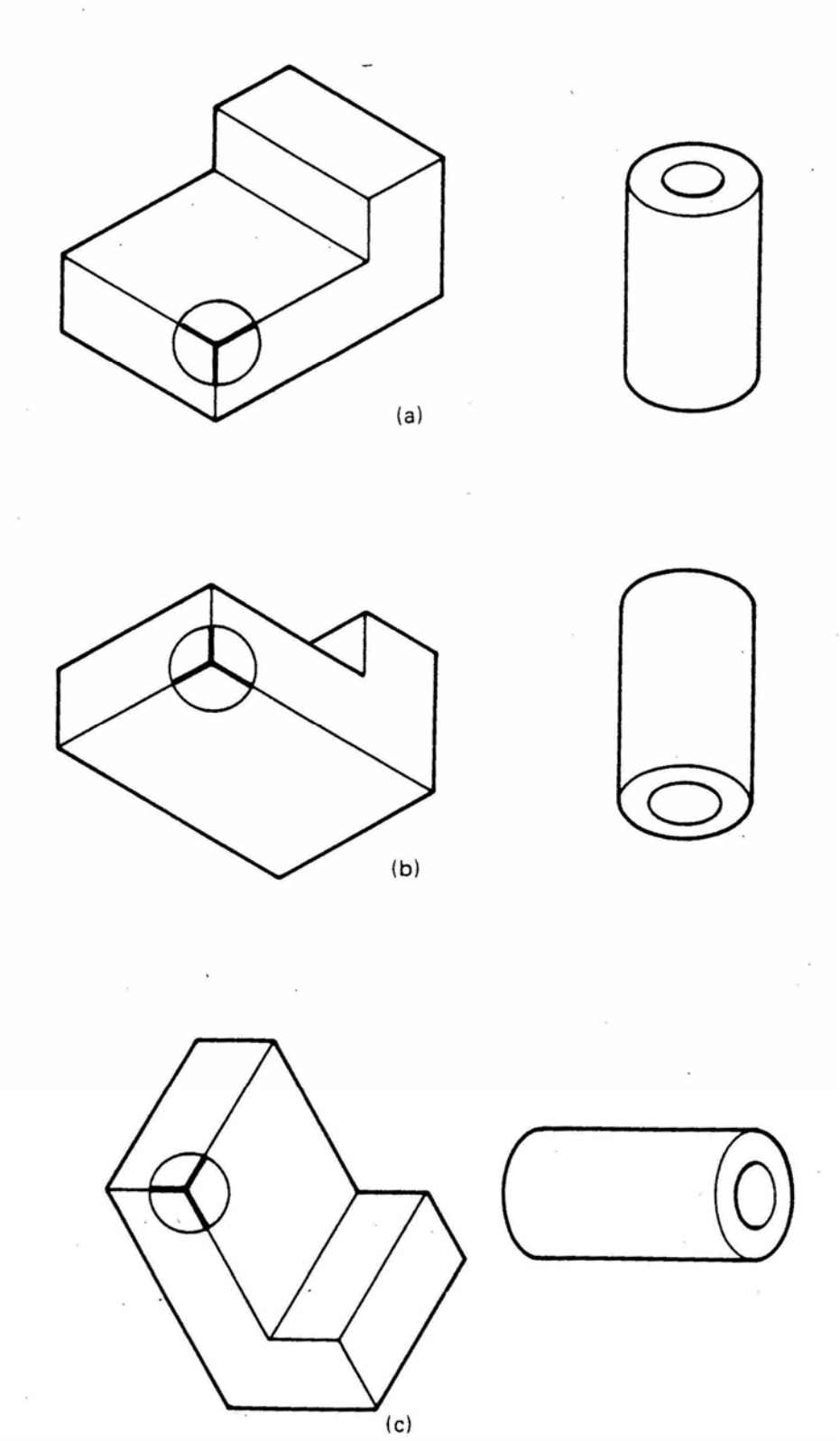
When a drawing is prepared with an isometric sale, or otherwise as the object is actually projected on a plane of projection, it is an **isometric projection**.

When a drawing is prepared with an ordinary scale, it is an **isometric drawing**.

Types of Isometric:

All isometric drawings are a form of a pictorial drawing in which the receding axes are drawn at 30˚ from the horizontal. There are three basic forms of isometric drawings known as:

1. Regular
2. Reverse
3. Long



Isometric axis variations: a) regular; b) reverse; c) long.

Regular Isometric:

The top of an object can be seen in the regular isometric from of drawing. In this form, the drafter can choose to view the object from either side.

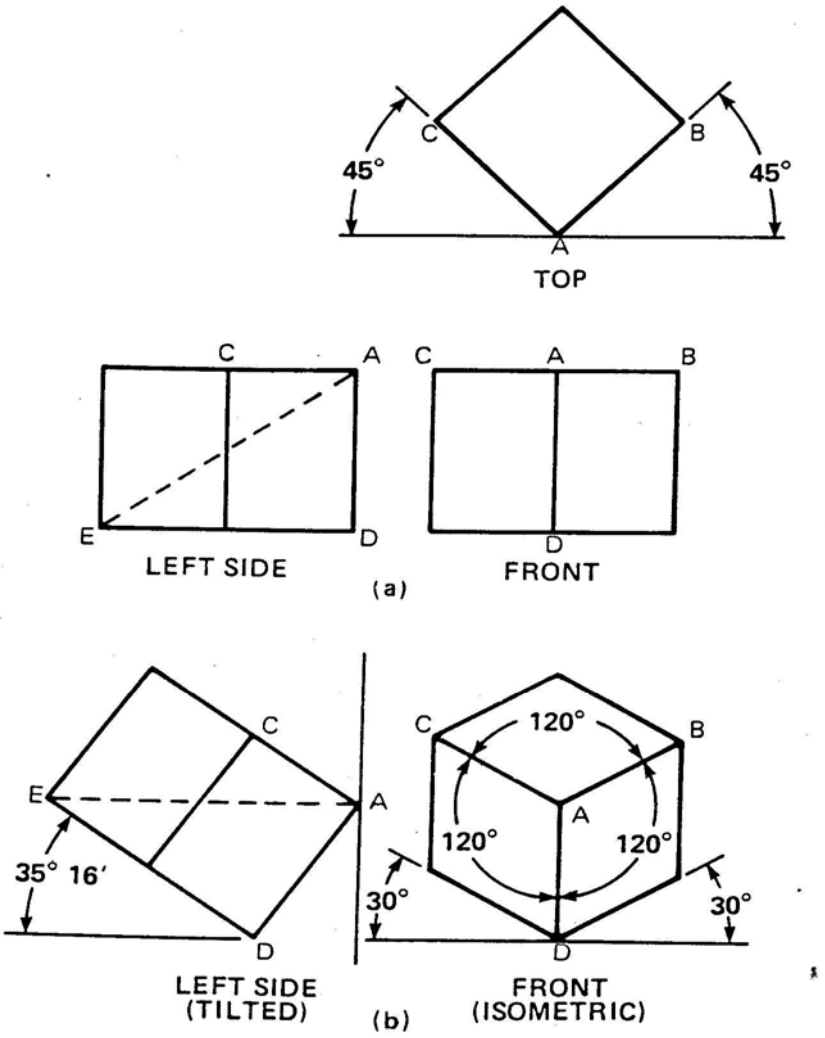
Reverse Isometric:

The only difference between a regular isometric and a reverse isometric, is that a reverse is a view of the bottom of an object instead of the top.

Long Axis Isometric:

The long axis isometric drawing is normally used for objects that are long, such as shafts. The drafter should choose the view that will give the most realistic presentation of the object. This involves one of the isometric axes being drawn horizontally. This is okay as long as there is still 120˚ between each axis.

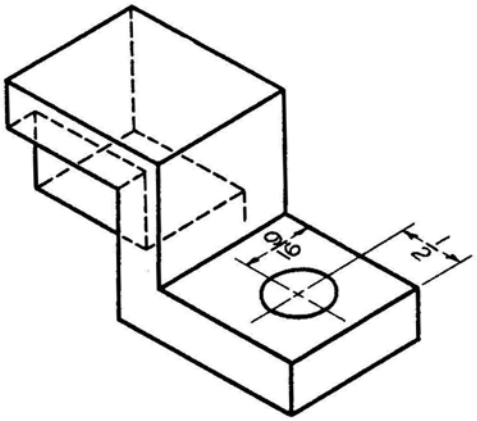
Steps in Creating Isometric Drawings:



Hidden Lines:

The use of hidden lines in isometric drawings is governed by the same rules as in all other types of projection:

Hidden lines are omitted unless they are needed to make a drawing clearer.

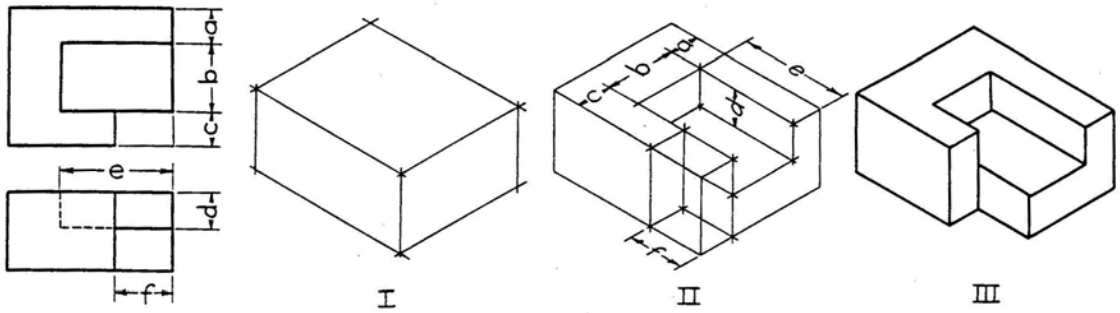


Use of Hidden Lines

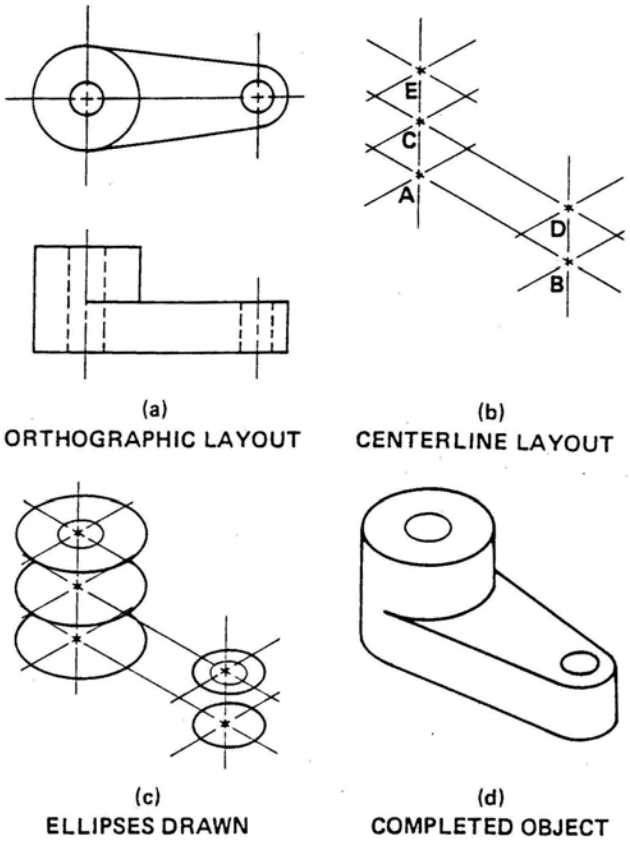
Center Lines:

The use of center lines in isometric drawings is governed by the same rules as in multiview drawings:

Center lines are drawn if they are needed to indicate symmetry or if they are needed for dimensioning.



Box construction



Isometric centerline layout method: a) orthographic layout; b) centerline layout; c) draw ellipses: d) completed object.