

Intermediate Engineering Graphics

3rd Week Lecture Notes

Instructor: Edward N. Locke

Topic: Pictorial Drawings (Isometric and Oblique)

1st Subject: Isometric drawing

Isometric (the most used of axonometric drawing): One corner of the object appears closest. The lines slanting away from this corner are 120 degrees apart, and are drawn true length. The word “isometric” literally means “equal measure”. Other axonometric drawings include diametric and trimetric, they are difficult to draw and are not used as often as isometrics. **In axonometric projection, the observer is considered to be at infinity, and the visual rays are parallel to each other and perpendicular to the plane of projection.**

Isometric drawings look like 2-point perspectives EXCEPT that, in isometrics, all lines parallel to the 3 axes are drawn parallel and at true length; in 2-point perspectives, two sets of lines converge to ‘vanishing points’ and lines are drawn at estimated length.

Isometric drawings can be used for client presentation and product literature, in the forms of explosion and assembly drawings.

1. Five steps in isometric drawing

- (1) Draw the three axis (30°-90°-30° from horizontal);
- (2) Mark the measurement on the axis (true length for all isometric lines);
- (3) Complete the enclosing block;
- (4) Remove or add parts;
- (5) Make the desired lines heavy.

2. **Basic rule to remember when drawing isometrics:** lines parallel in orthogonal view must be parallel in an isometric view (AutoCAD ISOPLANE feature makes this task easy).

Lines drawn in isometric drawings include:

- (2) **Isometric lines:** parallel to the axis, drawn in full scale.
- (2) **Non-isometric line:** not parallel to the axis, not drawn in full scale

3. **The correct way to draw isometric ellipses:** the minor axis of the ellipses must always align with one of the axis and be parallel to one of the isometric plane. The apparent direction of the major axis: left-to-right on the top plane, upper left-to-lower right on the left plane, upper right-to-lower left on the right plane, if connected, the three major axis of the three ellipses on the three planes will form an “Upside down Triangle” (or “Right side Up Triangle” if bottom view replaces the top view). Also, for any isometric plane, the major axis of the isometric elliptical circle will line up with the set of smaller opposite angles of the bounding box, and the minor axis will line up with the set of larger opposite angles of the bounding box (the Minor Axis-Larger Angles and Major Axis-Smaller Angles Appearance).

2nd Subject: Oblique Drawing

Oblique drawings: in this type of drawings, one side of the object appears closest. The top and one side slant away. They are useful for circular objects. Oblique sketches are based on one perpendicular set of lines and one receding line, at any angle but with 30° or 45° as the most common. All receding lines are parallel. **The oblique drawing is based on oblique**

projection where 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 oblique drawing, one side of the object appears closest. The top and one side slant away. Useful for circular objects. Oblique sketches are based on one perpendicular set of lines and one receding line, at any angle but with 30° or 45° as the most common. All receding lines are parallel. Oblique drawings include three types:

1. **cabinet** (true length for front sides but half length for the sides on the top and the slanting side. Cabinet oblique looks more natural than other forms of oblique drawings);
2. **cavalier** (true length for all sides); and
3. **general** (3/4 scale for the receding axis, drawn at about 15° with horizontal).

Oblique drawings look like 1-point perspectives EXCEPT that, in obliques, all parallel lines in any given plane or surface are drawn parallel and at some prescribed scale of the true length; in 1-point perspectives, one set of lines converge to ‘vanishing point’ and lines are drawn at estimated length.

Five steps in oblique drawing

- (1) Draw the three axis (0°-90°-30° or 45 from horizontal);
- (2) Mark the measurement on the axis (true length for isometric and cavalier oblique; true length on x- and y-axis but half length on z-axis for cabinet oblique);
- (3) Complete the enclosing block;
- (4) Remove or add parts;
- (5) Make the desired lines heavy.

Study Questions

1. What is the most commonly used form of pictorial drawings in the presentation of products?
2. What is the most used form of pictorial drawings?
3. What are the two most common types of perspective drawings? And what is their relationship with other types of pictorial drawings such as isometric and oblique drawings? Explain the way they are drawn.
4. What are three types of oblique drawings? Explain the way they are drawn.

5. Are all lines in isometric drawings drawn at true length? Please explain in detail.