

CHAPTER III

PICTORIAL DRAWING

3.1 Introduction:

Pictorial drawings are a type of technical illustration that shows several faces of an object at once. Such drawings are used by any industry that designs, sells, manufactures, repairs, installs, or maintains a product. They are used to convey general shape and structure of an object. These types of drawings are much easier for people who do not have a background reading blueprints and multi-view drawings to comprehend.

Pictorial drawings: -

- ❖ Looks more like pictures than a multi-view drawing (3D).
- ❖ Easier to visualize design
- ❖ Sometimes added to multi-view drawing for clarification
- ❖ Good for marketing, shows assembly, inspect fits, conceptual ideas
- ❖ Not good for dimensioning/manufacturing (can't show detail)

3.2 Comparison between pictorial drawing and Multi-view

- Multi-view projection is a method by means of which the exact shape of an object can be represented by two or more separate views produced on projection planes that are usually at right angles to each other.
- Pictorial drawings are drawings which show several faces of an object at once on a single plane of projection.
- We can show only two dimensions on one view of a multi-view drawing.
- But in a pictorial drawing we can give the third dimension on the given drawing.
- To execute a multi-view drawing a thorough understanding of the principles of projection is required.
- To read a multi-view drawing a definite exercise of the constructive imagination is required.
- But pictorial drawing can be easily understood by persons without technical training

- For specific size information, the multi-view drawings are heavily relied on and are the most common technical choice.

3.3 Types of pictorial drawings:

Pictorial drawings are projected on a single plane of projection by the methods of:

1. Axonometric,
2. Oblique and
3. Perspective (Central) projection

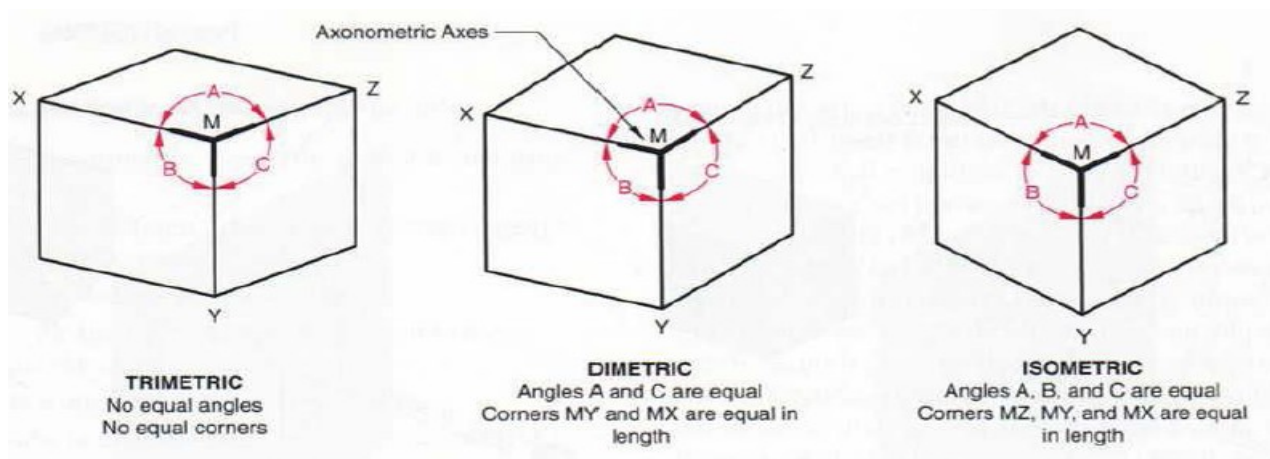
3.3.1 Axonometric drawing

The term axonometric is made up of two Greek words “Axon = axis; metric = measure. Axonometric projection is a parallel projection technique used to create a pictorial drawing of an object by rotating the object on an axis relative to a projection or picture plane. Similar to multi-view projection the line of sites in axonometric projection are perpendicular to the plane of projection, thus both are considered as orthographic projections. The difference is that in multi-view drawing only two dimensions of an object are visible in each view and more than one view is required to define the object, whereas in an axonometric drawing, the object is rotated about an axis to display all three dimensions and only one view is required.

Axonometric drawings are classified by the angles between the lines comprising the axonometric axes (axes that meet to form the corner of the object that is nearest to the observer).

- When the three angles are unequal, the drawing is classified as a “*trimetric projection*”.
- When two of the three angles are equal, the drawing is classified as a “*dimetric projection*”.
- When the three angles are equal, the drawing is classified as an “*isometric or equal measure projection*”.

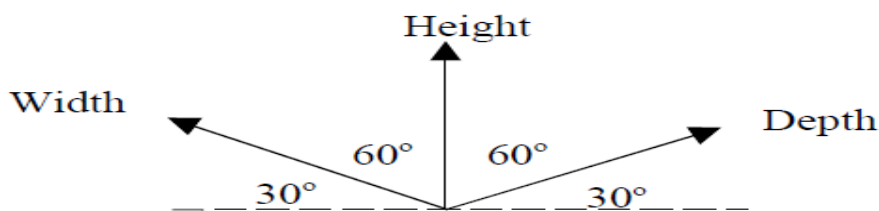
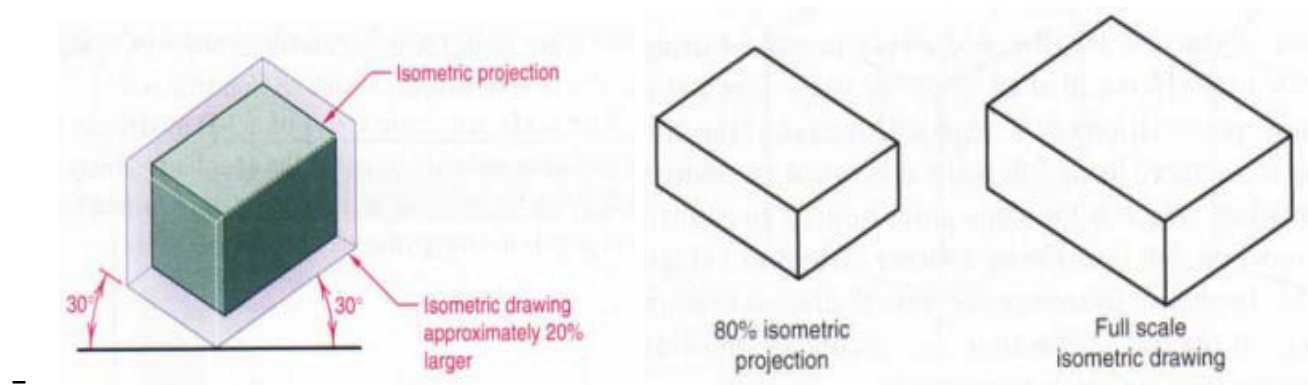
The isometric projection is easiest to draw and dimension, and is therefore the one that will be described in the following section. The three types of axonometric drawings are shown in the following figure.



3.3.1.1 Isometric drawing

Isometric projection is a true representation of the isometric view of an object.

- Isometric projection: is drawn at scale of 0.816
- Isometric drawing: is drawn at full scale

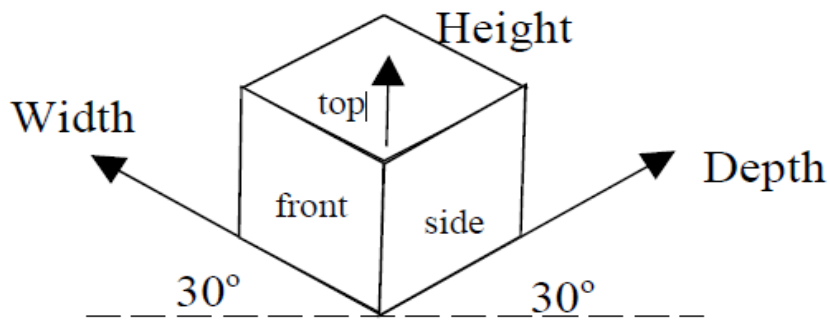


These represent the principle or isometric axes directions.

They typically indicate Width, Depth, and Height as shown.

Lines parallel to these directions will be very important for construction of isometric drawings because these are the only directions along which lengths will not be distorted.

A cube shown as an isometric drawing would look like:



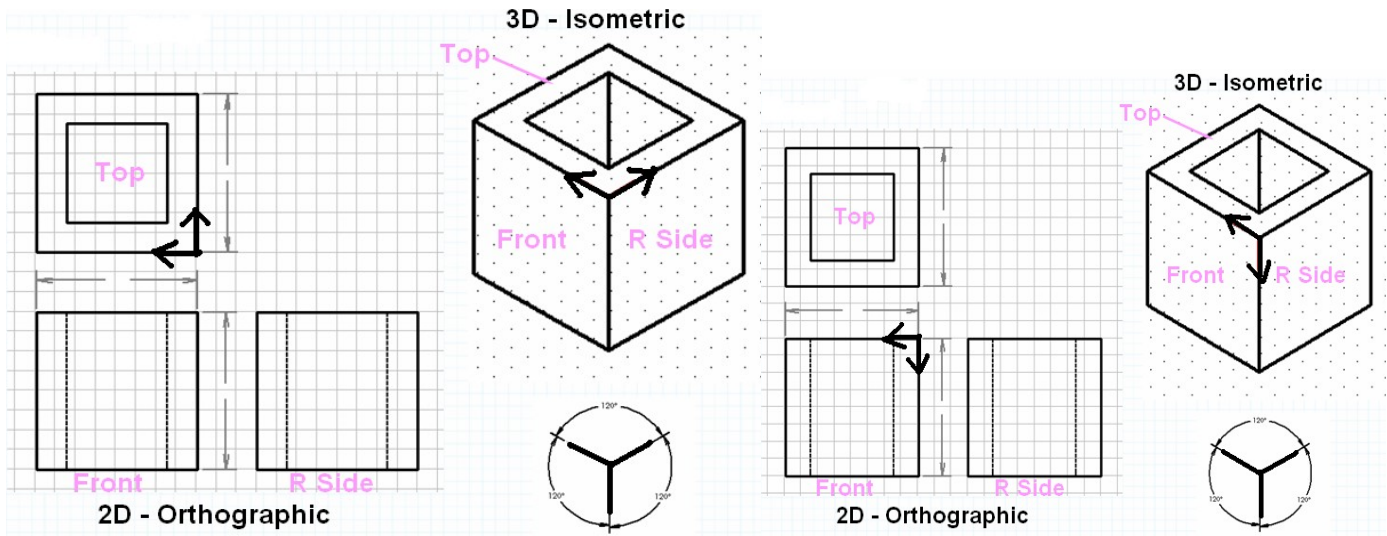
Notice how the diagonals across the face of any side of the cube are not equal in length.

Also note that the corner angles of any side which we know to be 90 degree angles are not drawn at 90 degrees in this type of drawing. Therefore, lengths, angles, and shapes are usually distorted in an isometric drawing.

Axis, Views and Dimensions in isometric drawing are shown as follow

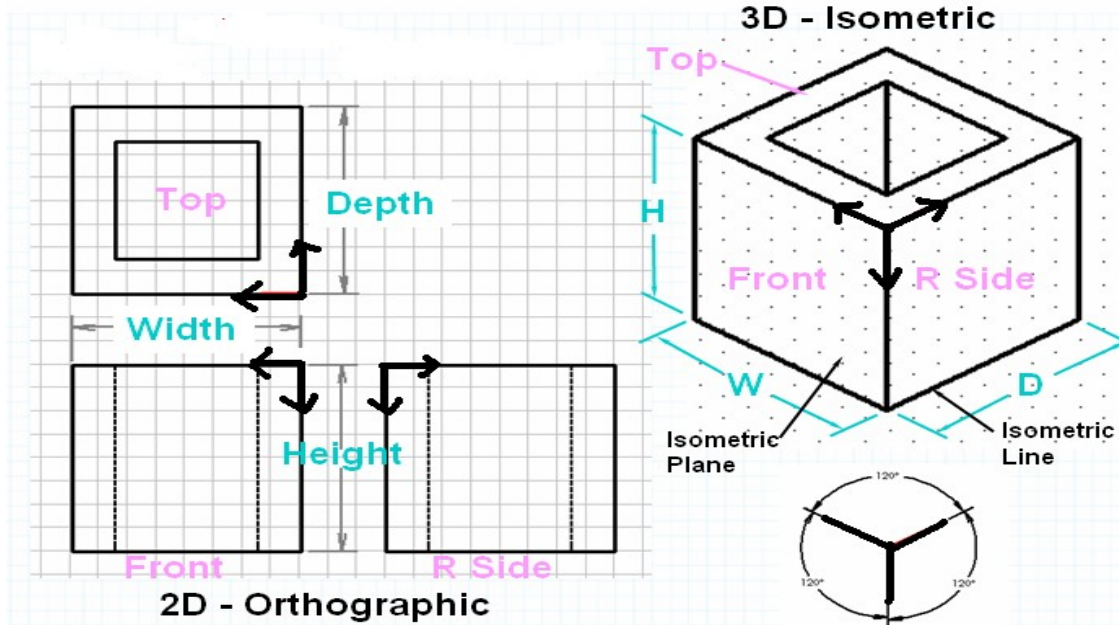
Axis and views:

The following figures show the axes in the multi view with the corresponding axis at the isometric drawing, and also the position of view in third angle projection.



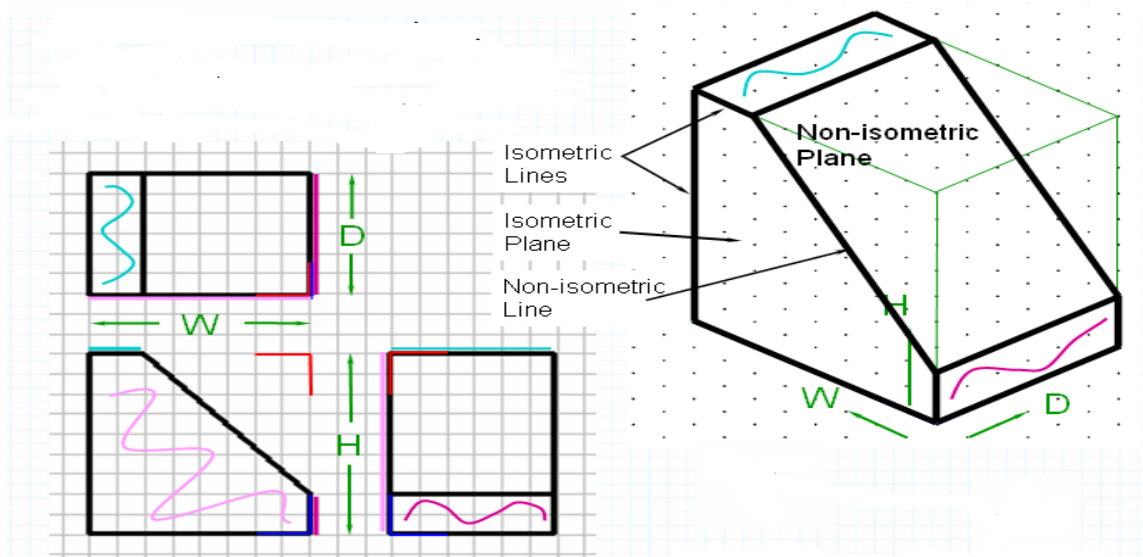
Dimensions and views

The dimensions in isometric drawing as well as in the three principal views are shown in the following figure.



Non isometric planes; Planes which are not parallel to any isometric **plane** are called **non-isometric planes**.

Non isometric lines; Lines in an object not parallel to the isometric axes are referred to as non isometric lines.



Constructing an isometric using the boxing - in method

Step 1. Determine the desired view of the object, then draw the isometric axes. For this example, it is determined that the object will be viewed from above (regular isometric),

step 2. Construct the front isometric plane using the W and H dimensions. Width dimensions are drawn along 30-degree lines from the horizontal. Height dimensions are drawn as vertical lines.

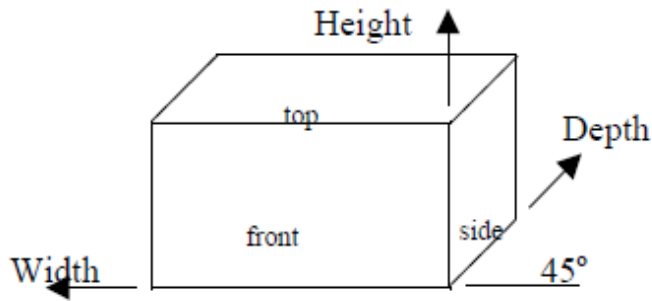
step 3. Construct the top isometric plane using the W and D dimensions. Both the W and D dimensions are drawn along 30-degree lines from the horizontal.

step 4. Construct the right side isometric plane using the D and H dimensions. Depth dimensions are drawn along 30-degree lines and height dimensions are drawn as vertical lines.

Step 5. Transfer some distances for the various features from the multiview drawing to the isometric lines that make up the isometric rectangle. For example, distance A is measured in the multiview drawing, then transferred to a width line in the front plane of the isometric rectangle. Begin drawing details of the block by drawing isometric lines between the points transferred from the multiview drawing. For example, a notch is taken out of the block by locating its position on the front and top planes of the isometric box.

3.3.2 Oblique Drawings:

Oblique drawings have one major advantage over isometric drawings. One side of the object they represent will be drawn in true size and true shape. The other two sides will be distorted as were the isometric drawings.



Notice how the depth direction is angled back such that all lines indicating depth are parallel.

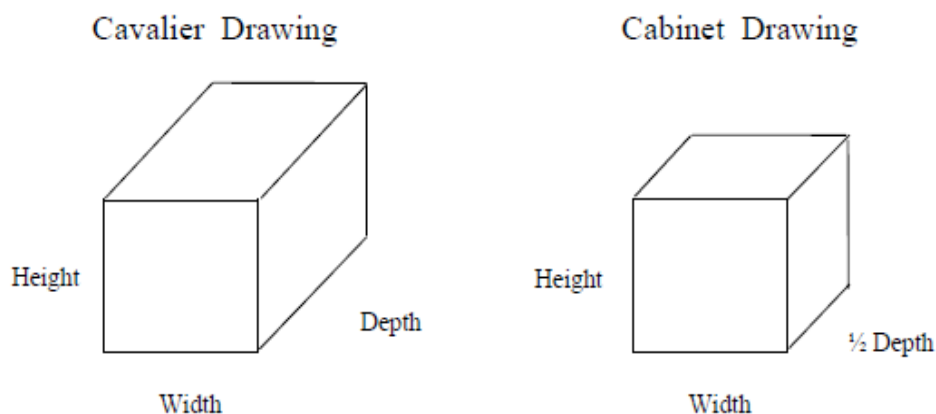
Most oblique drawings have depth lines which go back at 45 degrees, but any angle is possible to use. Use of 60 and 30 degree angles for depth are also common.

There are two common variations of oblique drawings

Cavalier Drawing: Uses a depth dimension that is at equal scale to the Width and Height dimensions. Due to how we perceive shapes, this type of drawing looks excessively deep and distorted. (Scale: H: W: D)

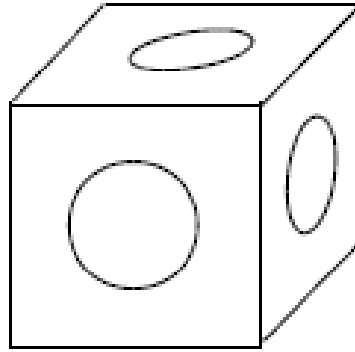
Cabinet Drawing: Uses a depth dimension that is only $\frac{1}{2}$ the scale of the dimensions used for Width and Height dimensions. This produces a visually more pleasing, well-proportioned appearance. Scale: (H: W: $\frac{1}{2}$ D)

Compare the appearance of the cube drawn by each method below.



In oblique drawings circular features will appear circular if they are placed in the front face.

Circular features will appear elliptical if they fall in the top or side views.

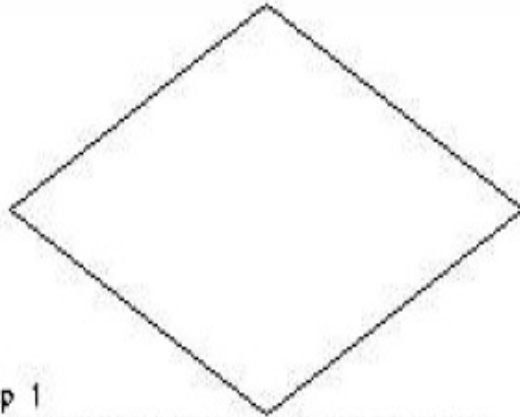


As a general rule, when using oblique drawings, it is best to try to keep complicated features (especially circular ones) in the front view.

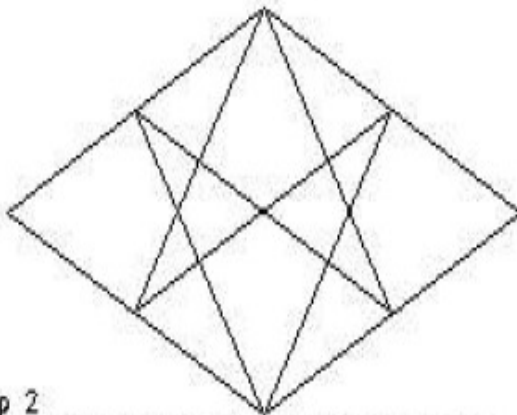
Construction of an Approximate Four-Center Ellipse:

When drawing circles in isometric drawings that are not of a size available on the template, we use the following method step by step to construct an approximate four point ellipse.

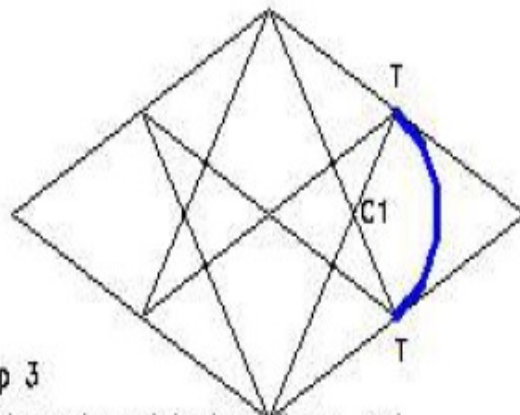
NB: The orientation of the construction rhombus depends upon the view the circular feature is to be drawn in. The one shown below is for a circular feature in the top plane.



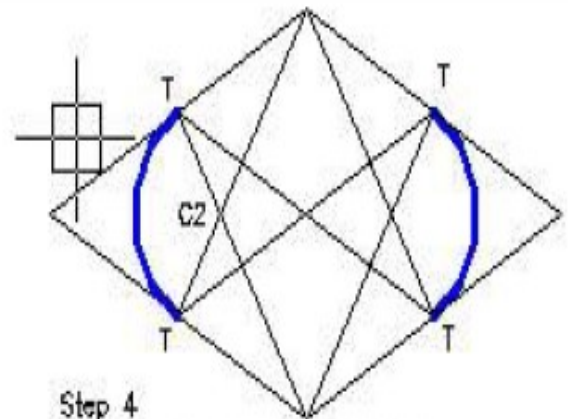
Step 1
Construct rhombus along principle axes with sides equal in length to the diameter of the circle



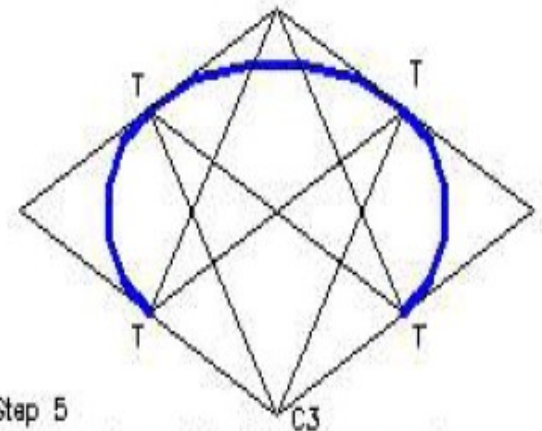
Step 2
Make construction line from corners of minor diagonal to center of opposite sides.



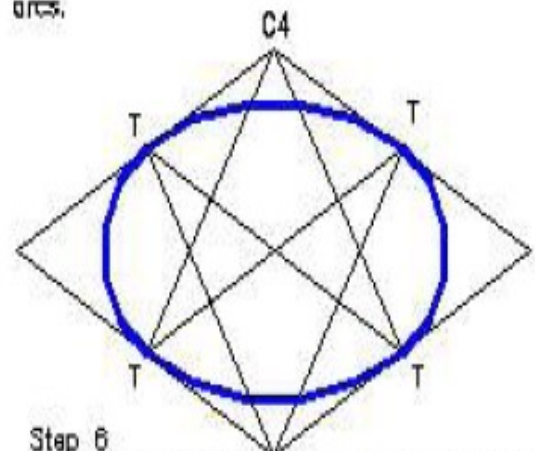
Step 3
Locate center point of small arc, and construct the arc from the center of one side to the center of the adjacent side.



Step 4
Repeat for the other small arc.



Step 5
Locate center point of large arc, and construct the arc that connects the small arcs.



Step 6
Repeat for the other large arc to complete the ellipse.

Some general comments about pictorial drawings

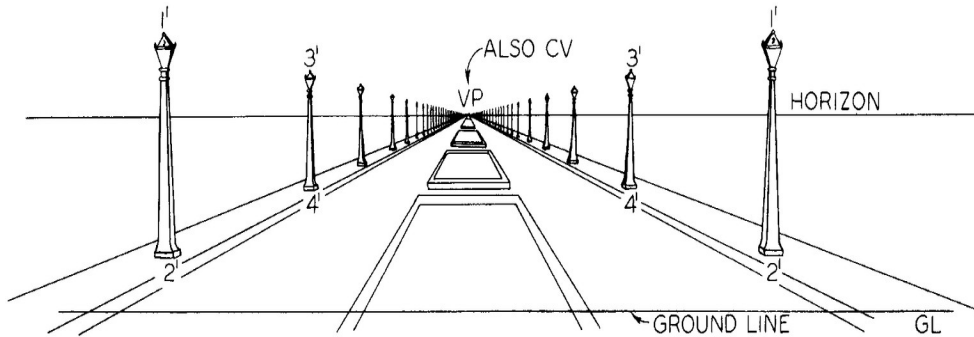
Construction of drawings should proceed in this order:

- 1) Create a box of construction (very light) lines along the principle axes which **encloses the entire overall form** and general shape of the body.
- 2) Next add other construction lines along principle axes to locate features of the body (usually edges of planes and surfaces).
- 3) Use offset dimensions to locate lines which don't follow the principle axes and lightly construct them.
- 4) Locate the center of circular features, and make construction boxes for creating the arcs.
- 5) Darken in the final lines starting with Circles and Arcs, Straight Lines (starting from the front of the object)
 - Construction lines if drawn light enough, need not be erased but you probably will want to erase them anyway.
 - Final lines should be dark, sharp, and consistent in width.
 - Do **not** show hidden lines in pictorial drawings unless absolutely needed to provide hidden details
 - Do **not** show center lines in pictorial drawings
 - **Holes are assumed to go completely through the object** unless their depth is indicated with a note or with hidden lines.
 - For your drawings, include your **name, class section**, and the **title of the drawing** in the lower right hand corner of the drawing.
 - Neat lettering counts toward the grade

3.2.3 Perspective Drawings

- Perspective drawings produce the view that is most realistic. A perspective drawing shows a view like a picture taken with a camera
- There are three main types of perspective drawings depending on how many vanishing points are used.
- These are called one-point, two-point, and three-point perspectives.

One Point Perspective

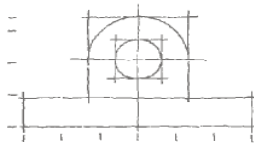


Orient the object so that a principal face is parallel to the viewing plane (or in the picture plane.) The other principal face is perpendicular to the viewing plane and its lines converge to a single vanishing point.

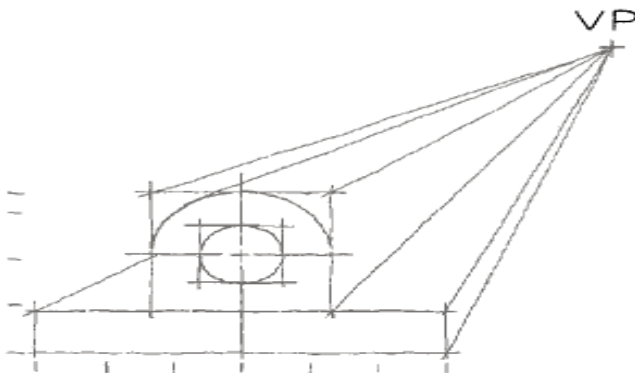
One-point Perspective Sketching

1. Sketch front surface of object and locate vanishing point.

VP
+



2. Sketch receding lines from intersections and points of tangency on front surface to vanishing point.



3. Estimate the depth of the object you will show and block in the back surface between the receding lines.

