Orthographic Projections

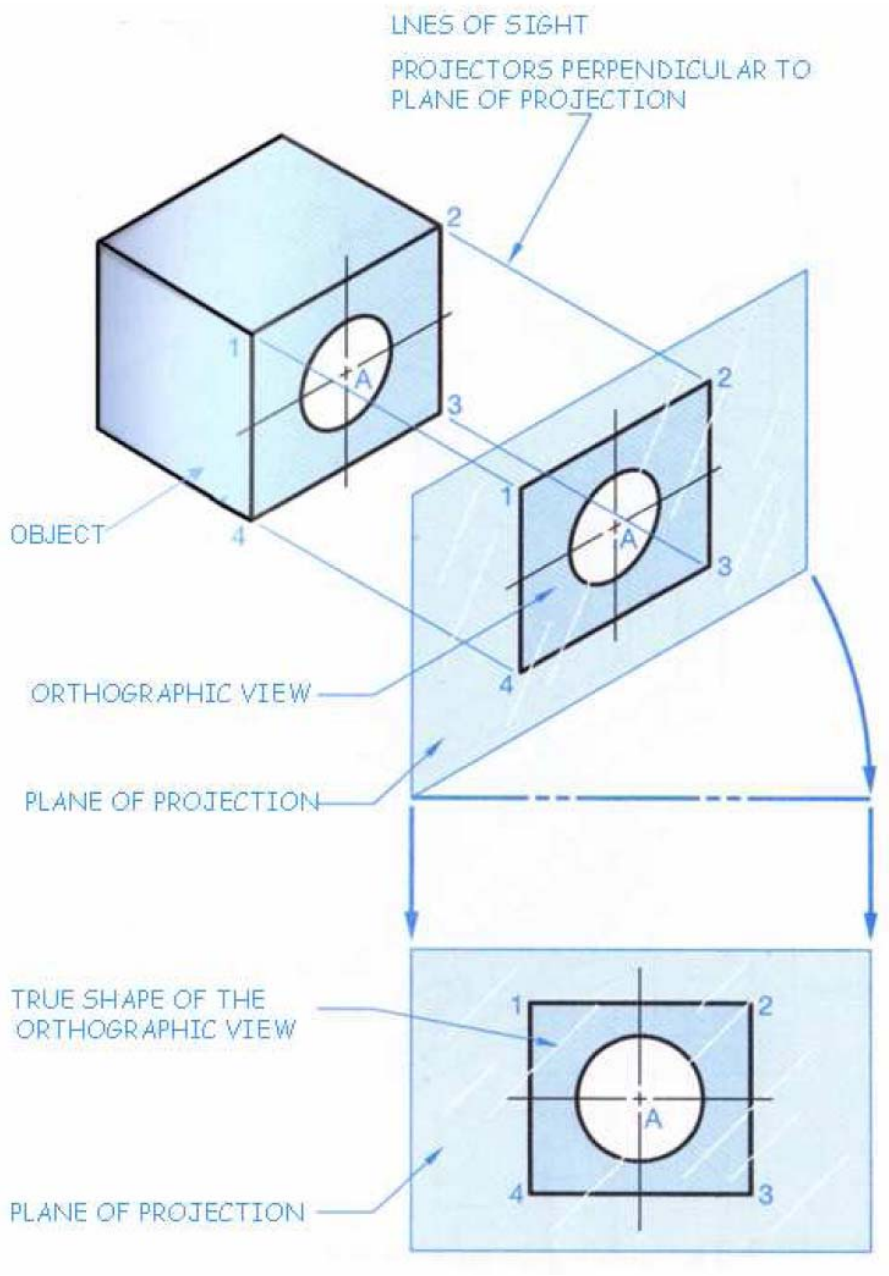
Advance

Sr. Dr Md Azree Othuman Mydin

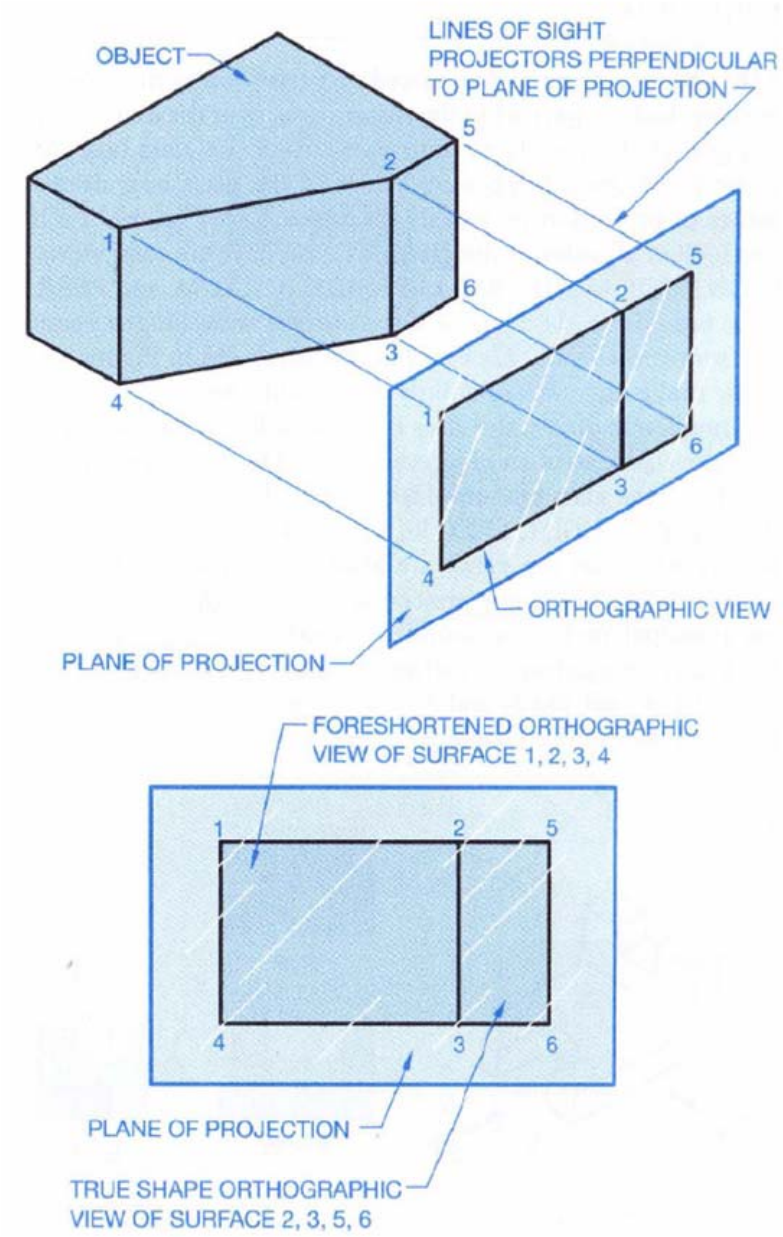
Orthographic Projection

- Orthographic projection is:
  - a system of drawing views of an object using perpendicular projectors from the object to a plane of projection
  - a means of representing physical objects and three-dimensional concepts into two dimensional drawings.
  - used to effectively describe the design and features of an object, so the object can be manufactured.

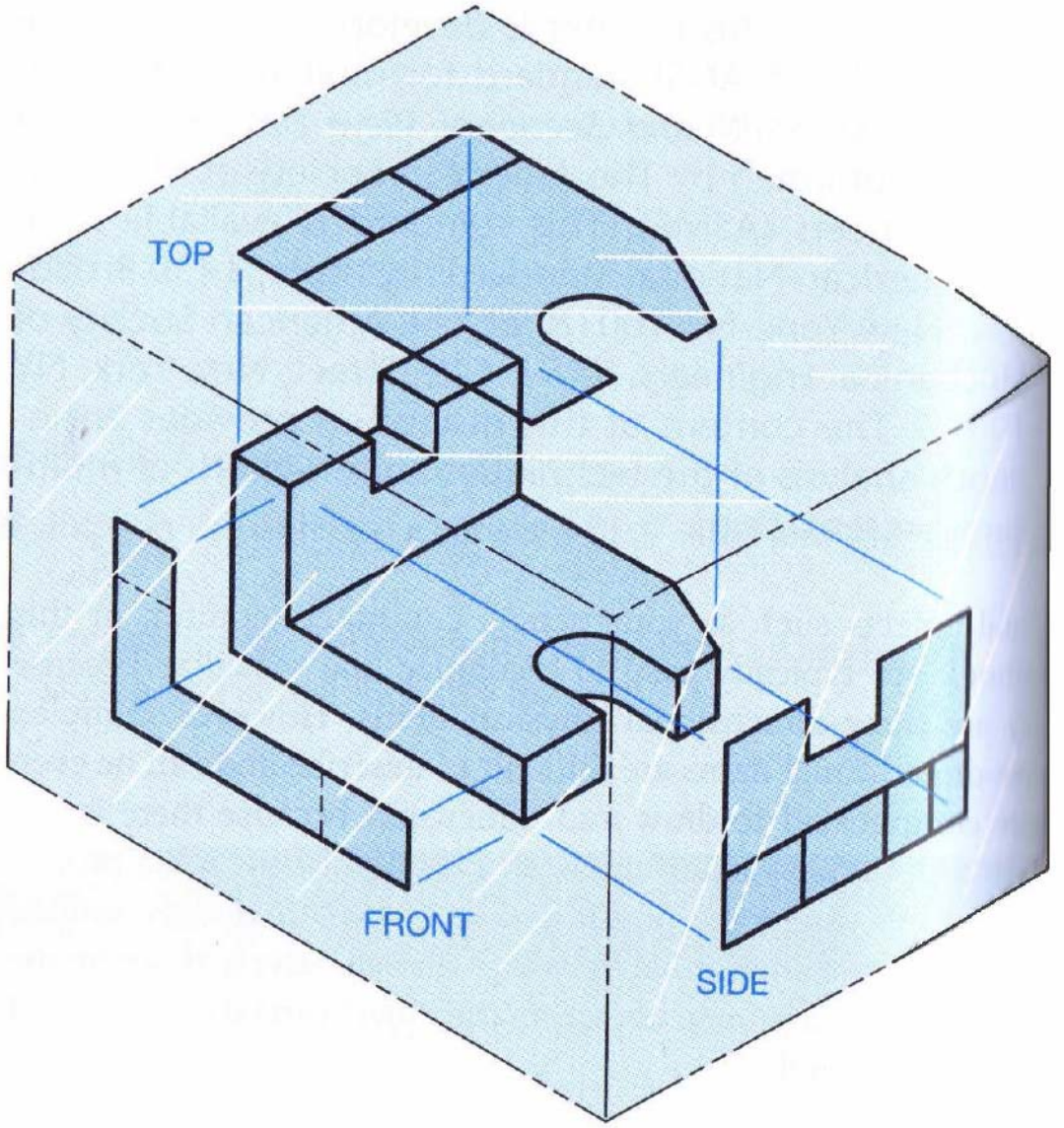
- Planes/surfaces parallel to the plane of projection appear in their true size and shape

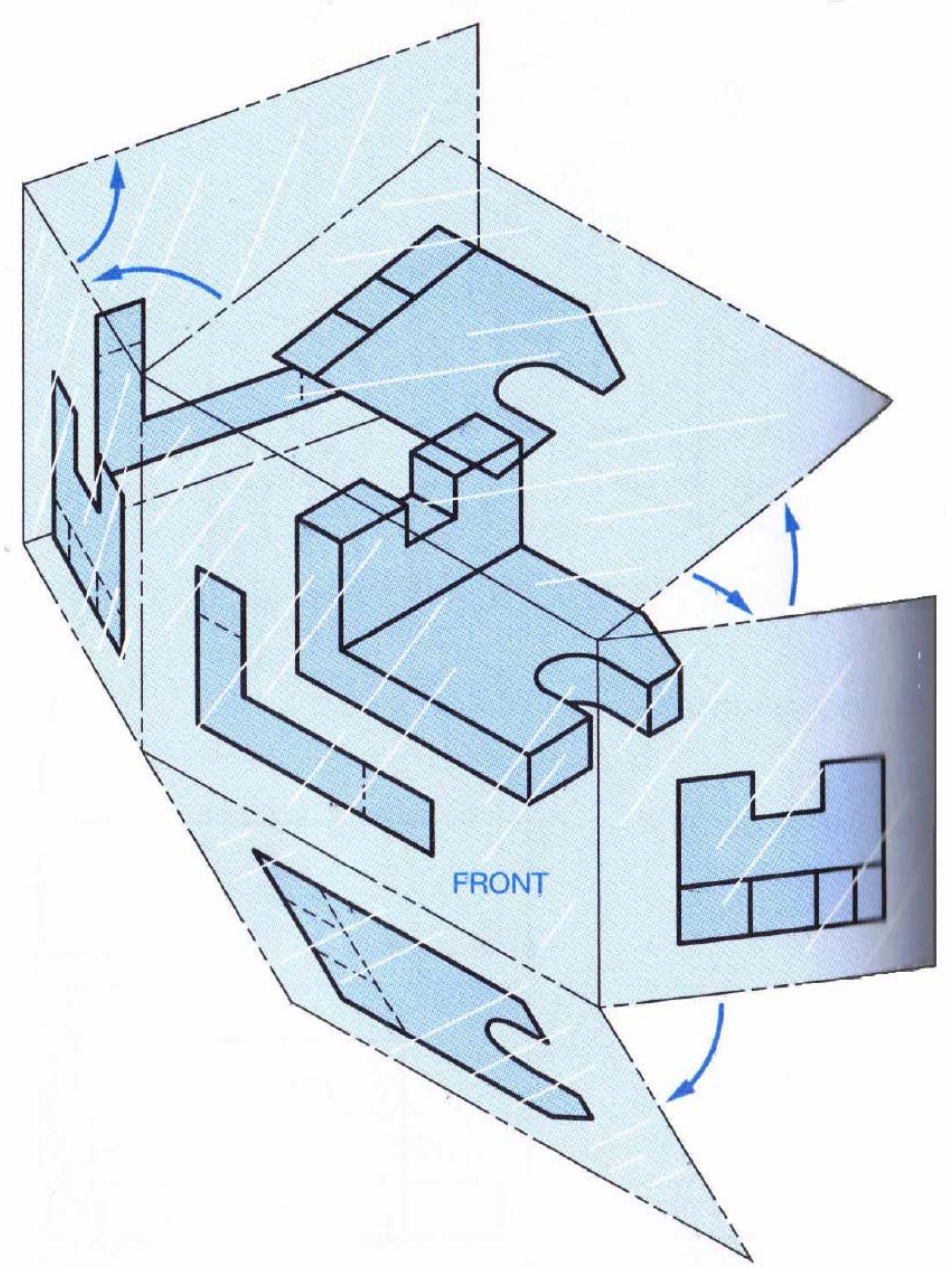


- Planes/surfaces which are not parallel to the plane of projection are foreshortened.
- Planes/surfaces which are perpendicular to the plane of projection appears as line.
- More than one view is required to fully describe most objects.

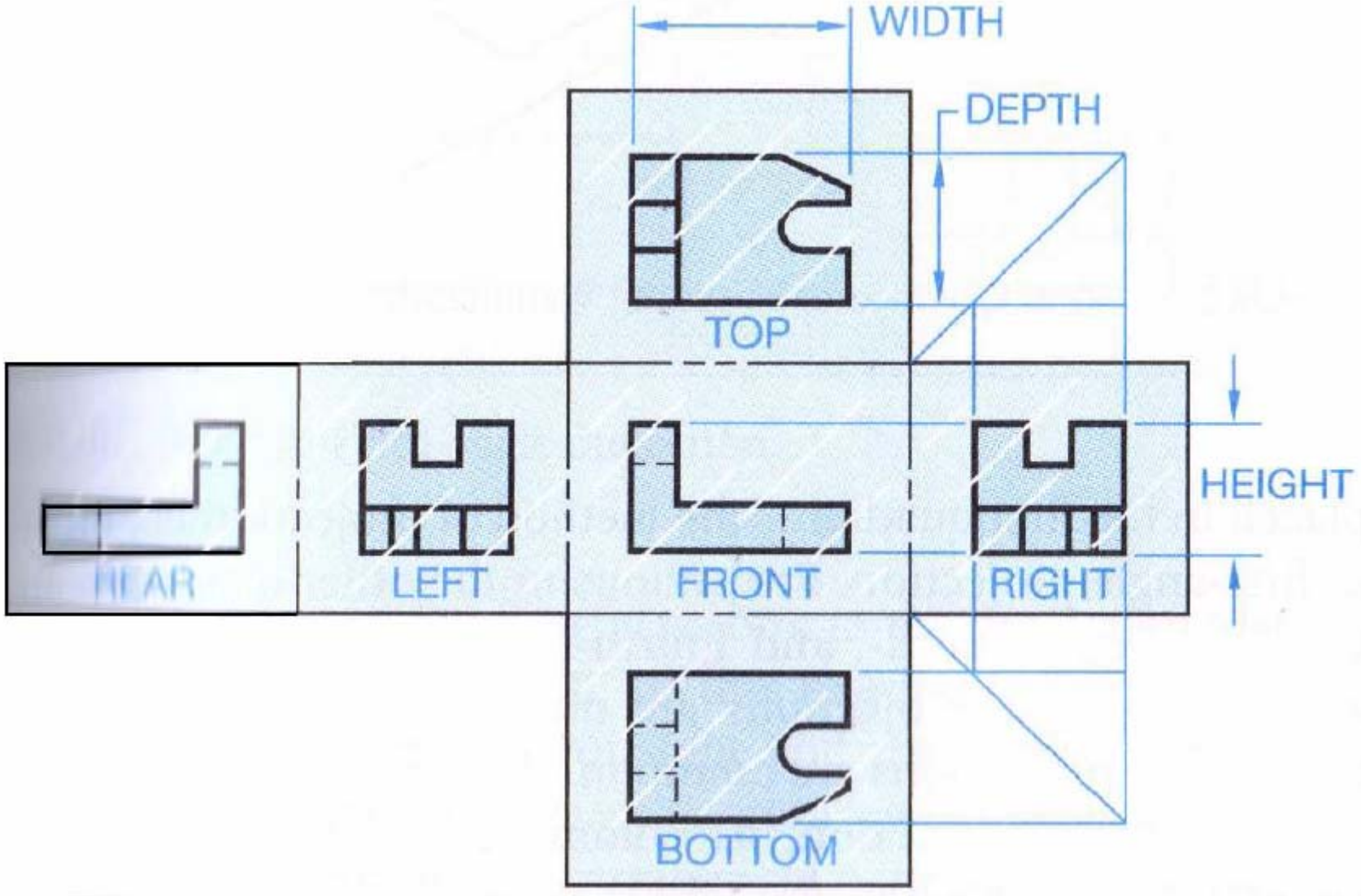


Glass box approach for multiview drawings



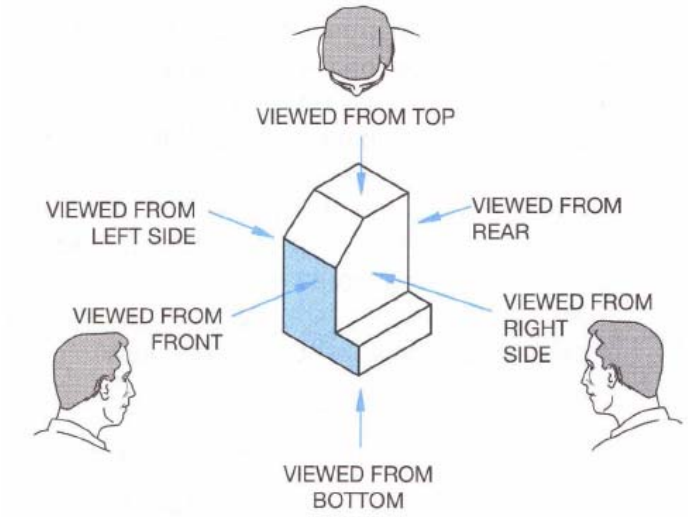


Unfolding the glass box at the hinges

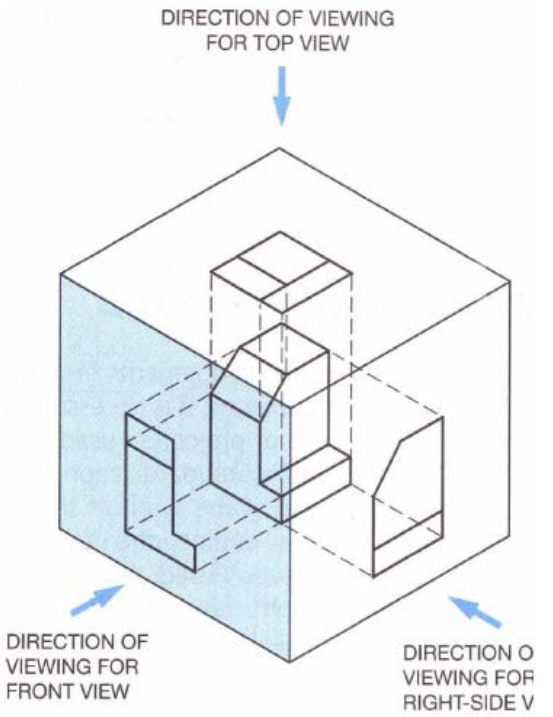


The six principal views (glass box unfolded)

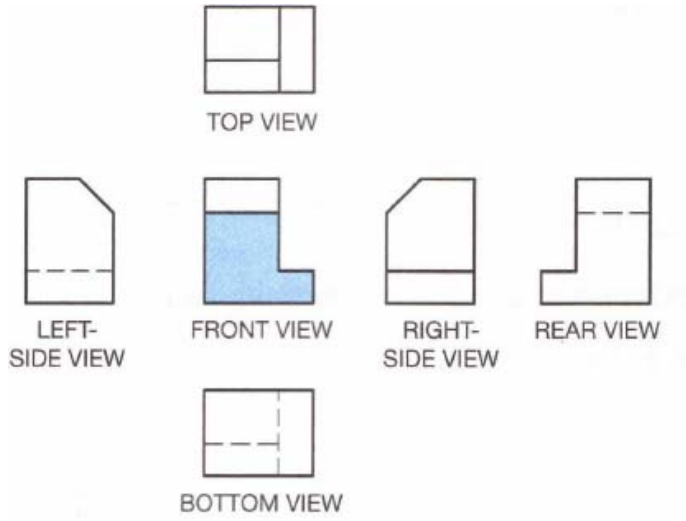
Example of Orthographic projection



a). Isometric

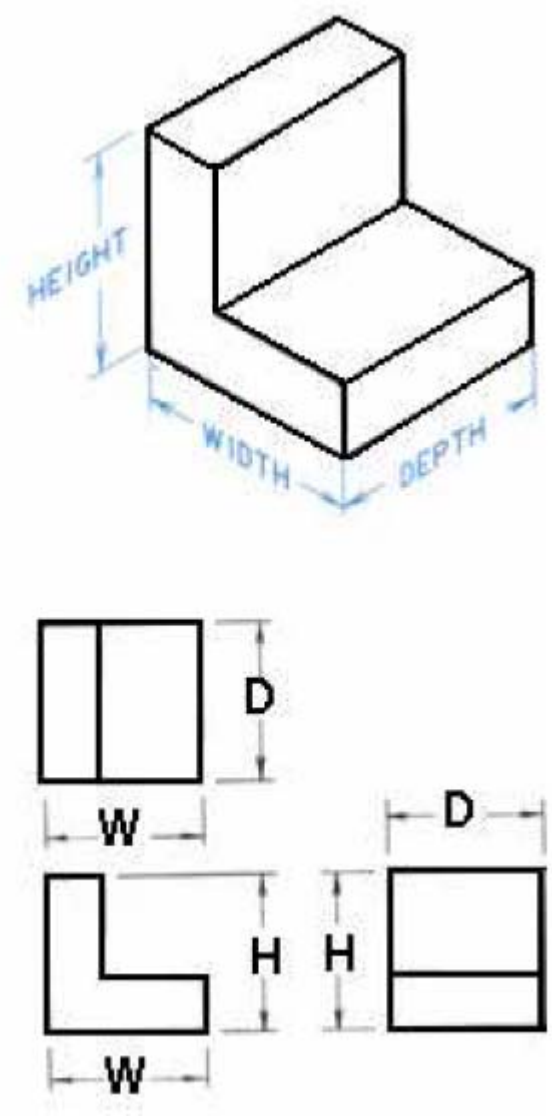


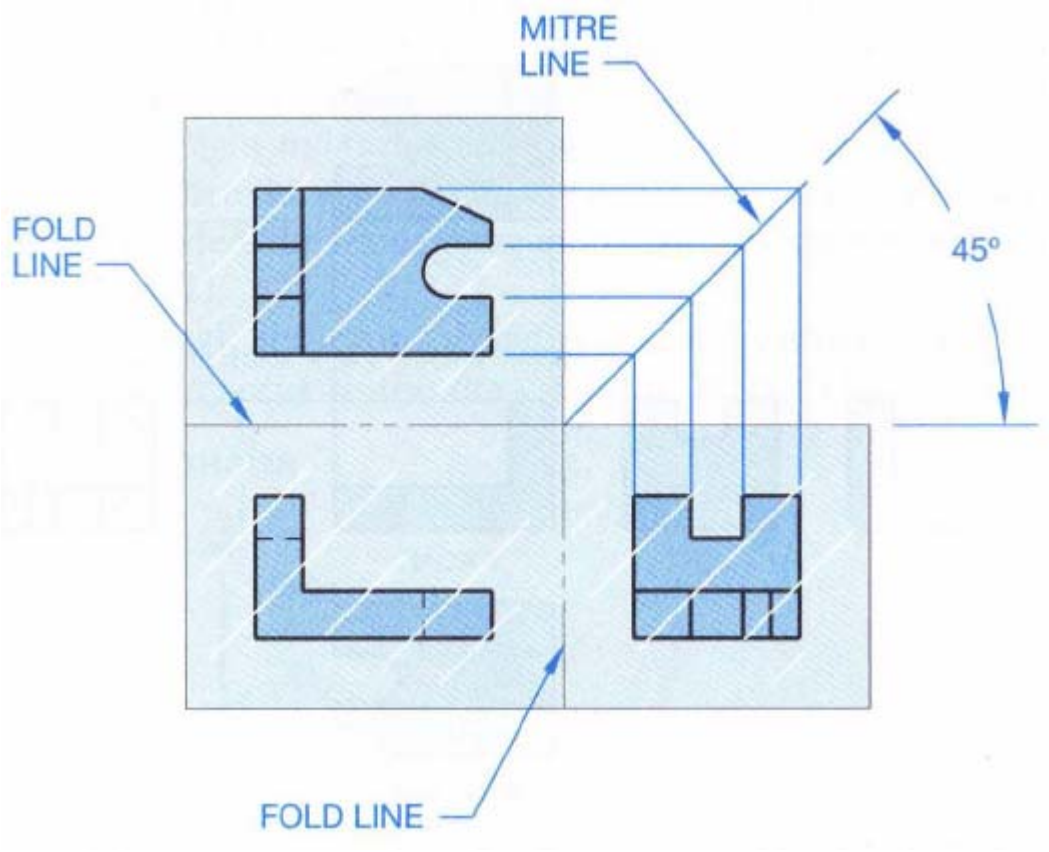
b). Object enclosed in a glass box



c).Orthographic projections

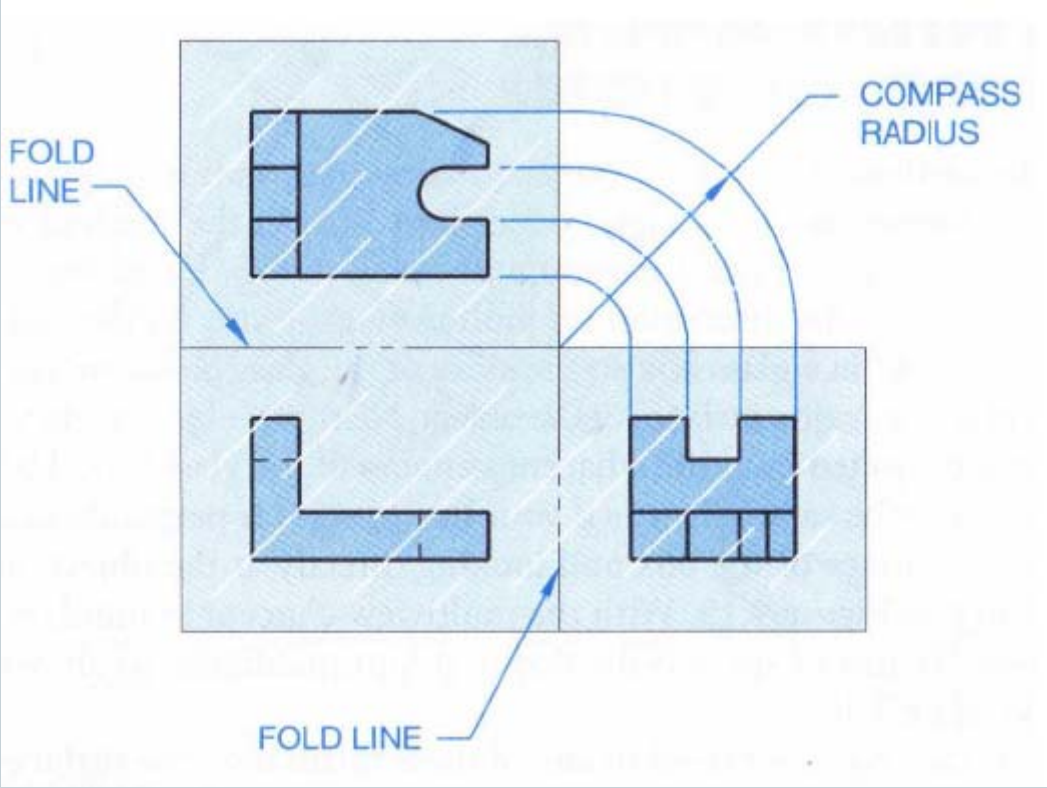
Relationship between orthographic views





Mitre Line to establish relation between views

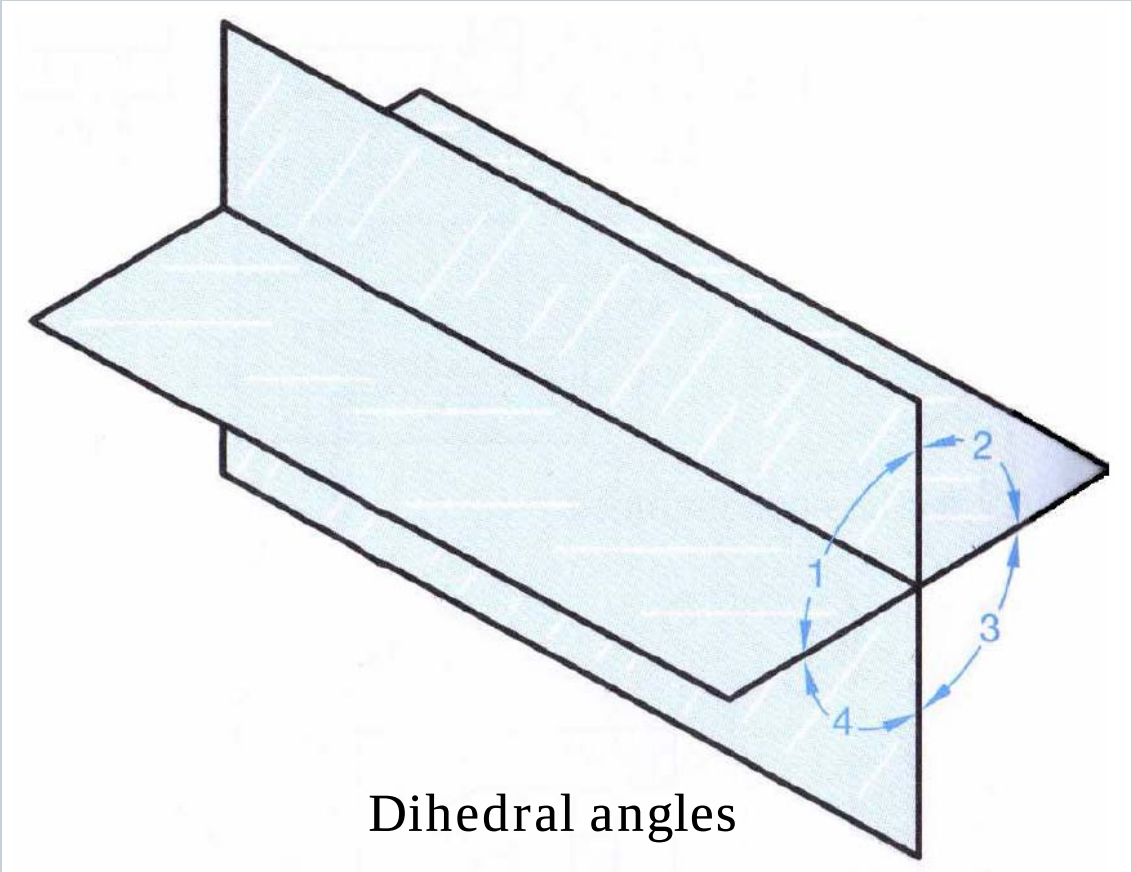
Relationship between orthographic views



Use of compass to establish the relationship between views

Orthographic Projection Systems

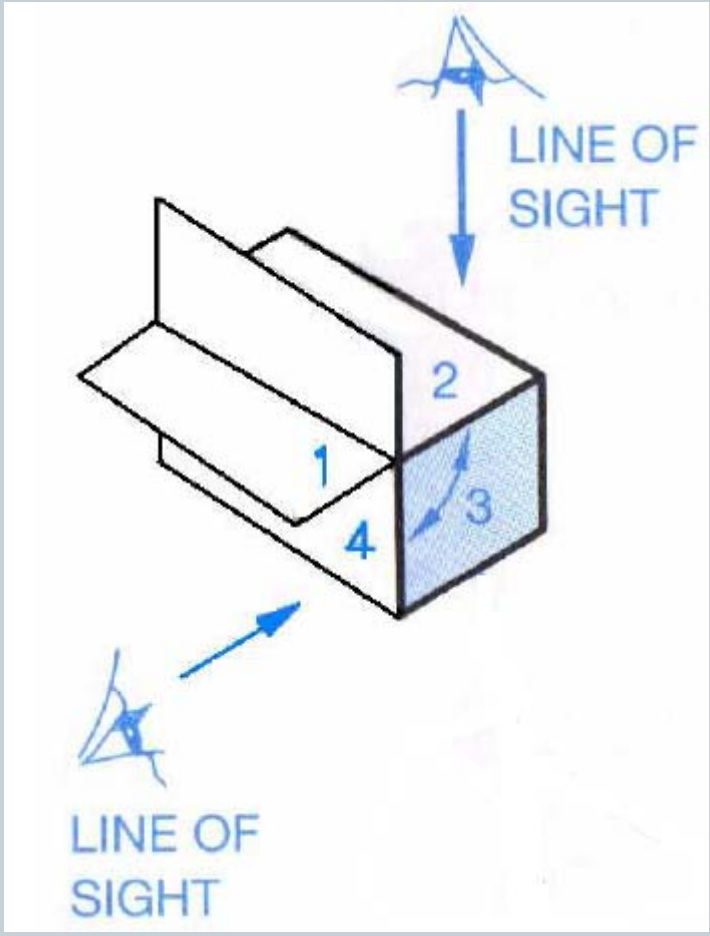
- Dihedral angles formed by intersection of vertical and horizontal planes at right angle

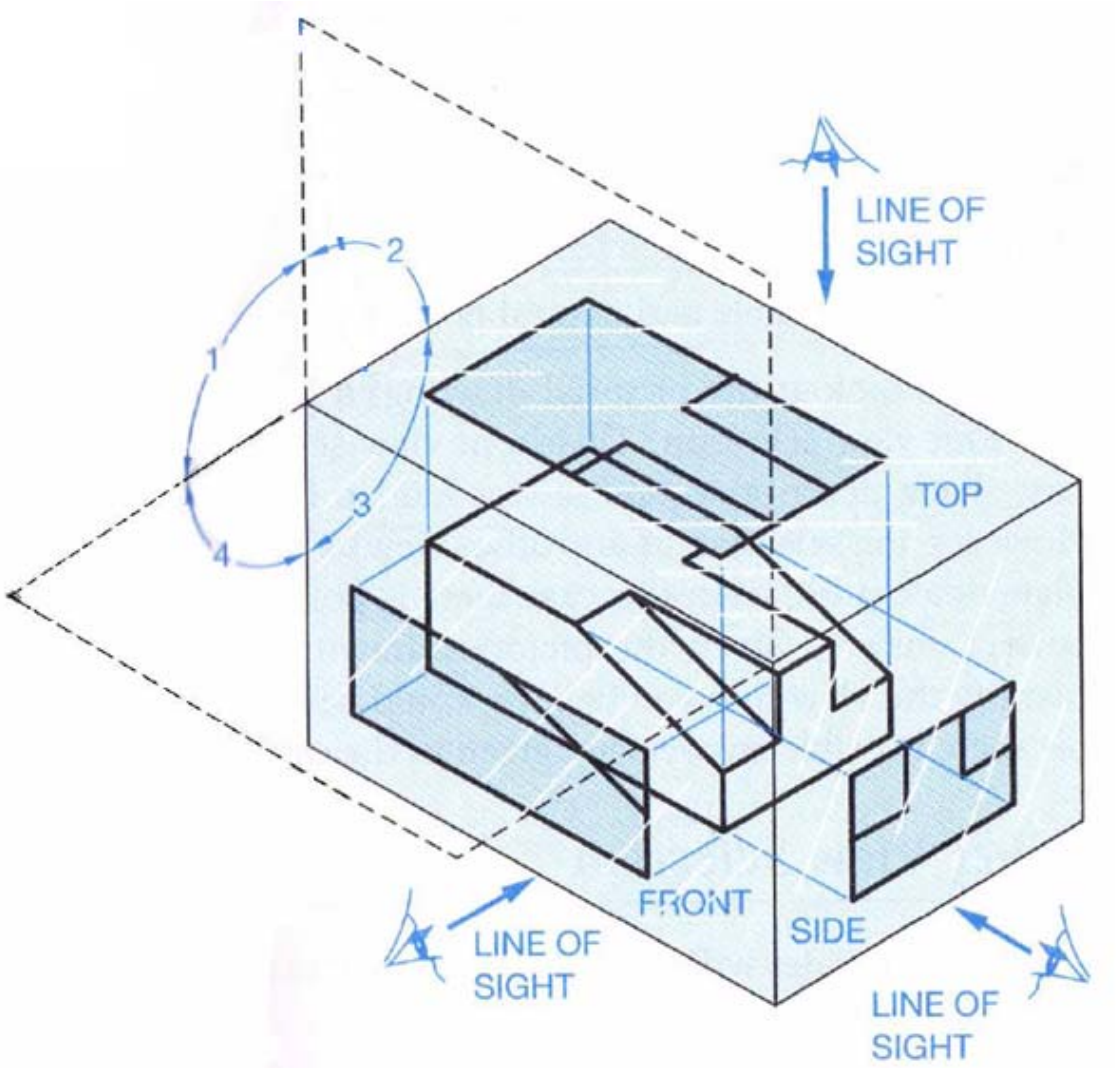


Dihedral angles

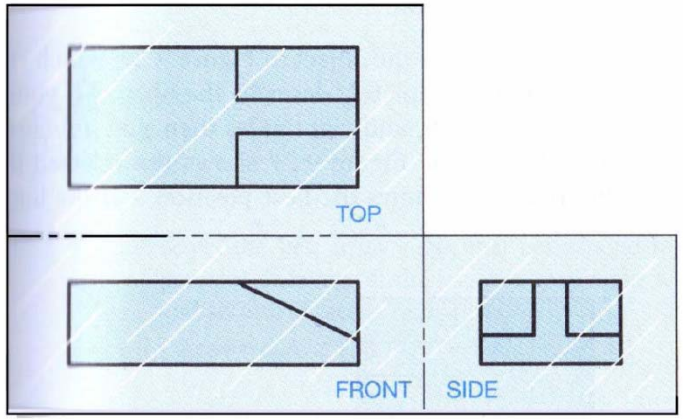
Third-Angle Orthographic Projection

- The object is placed in the third quadrant and projected into the planes.
- The plane of projection is located between the viewer and the object.
- It is extensively used in United States, Great Britain and Canada
- Standards Australia recommends using third angle projection system.

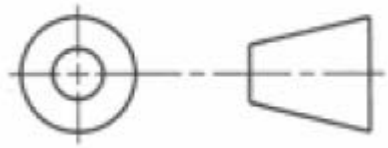




a) Placement of object in third-angle projection



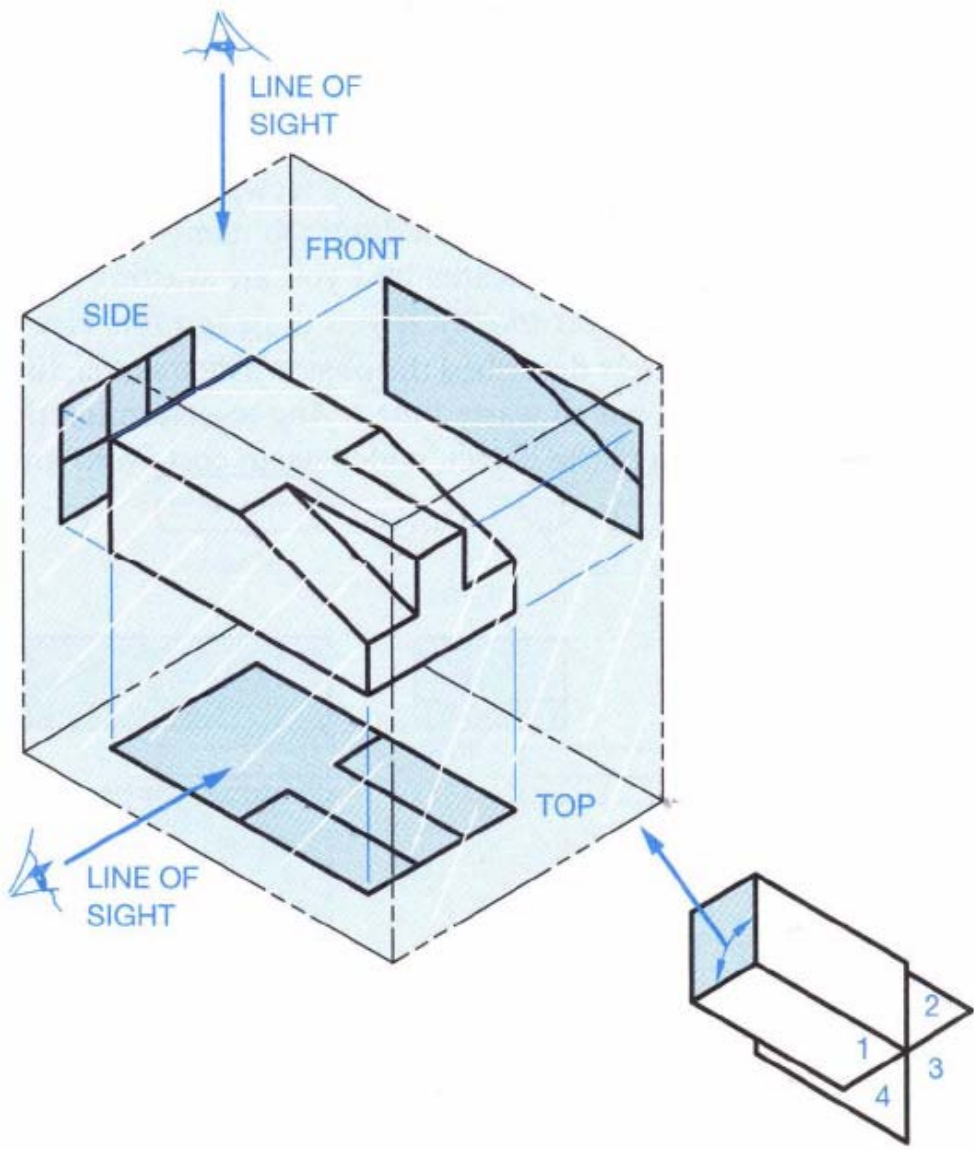
b) Placement of the three principal views in third-angle projection



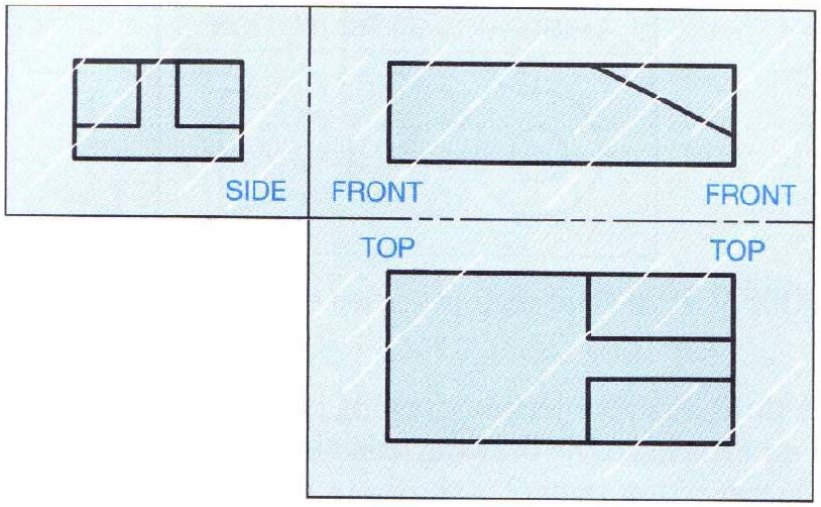
c) Symbol for 3rd angle projection system

First-Angle Orthographic Projection

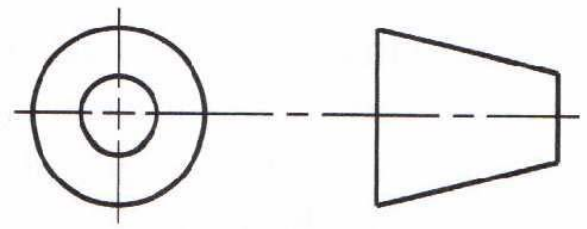
- Used by most of the World, including Europe and Asiatic countries.
- The object is placed in the first quadrant
- The object is between the viewer and the projection plane.



a) Location of object in first-angle projection system



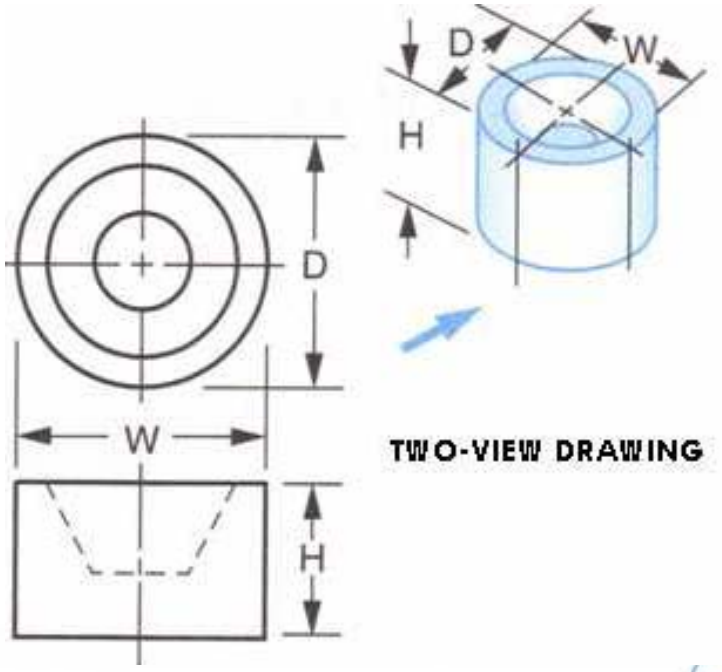
b) Placement of the three principal views in first-angle projection



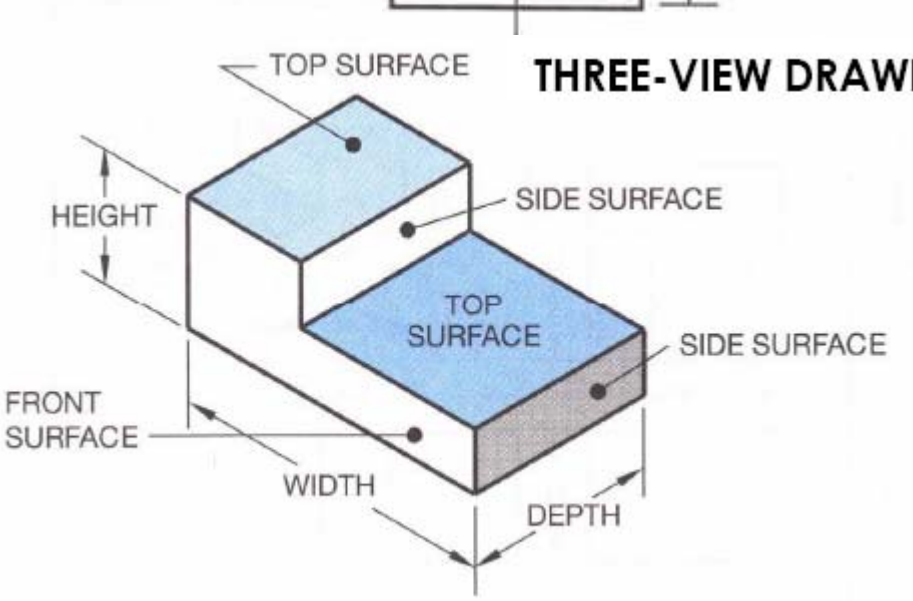
c) Symbol for first-angle projection system

Multiview Drawings

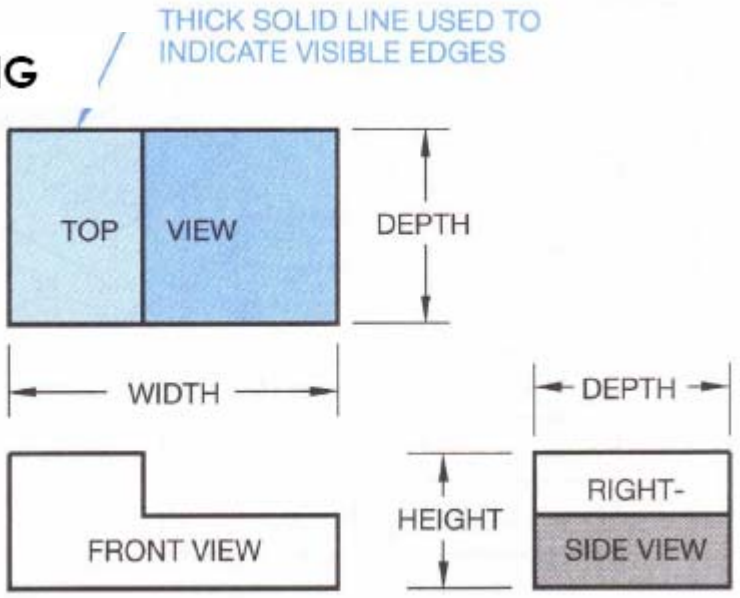
- A multiview drawing provides two or more views (orthographic projections) of an object to represent its shape.
- Depending on their complexity, objects may require two, three or more views for complete shape description.
- The most commonly used orthographic views are the front, top and side.



TWO-VIEW DRAWING



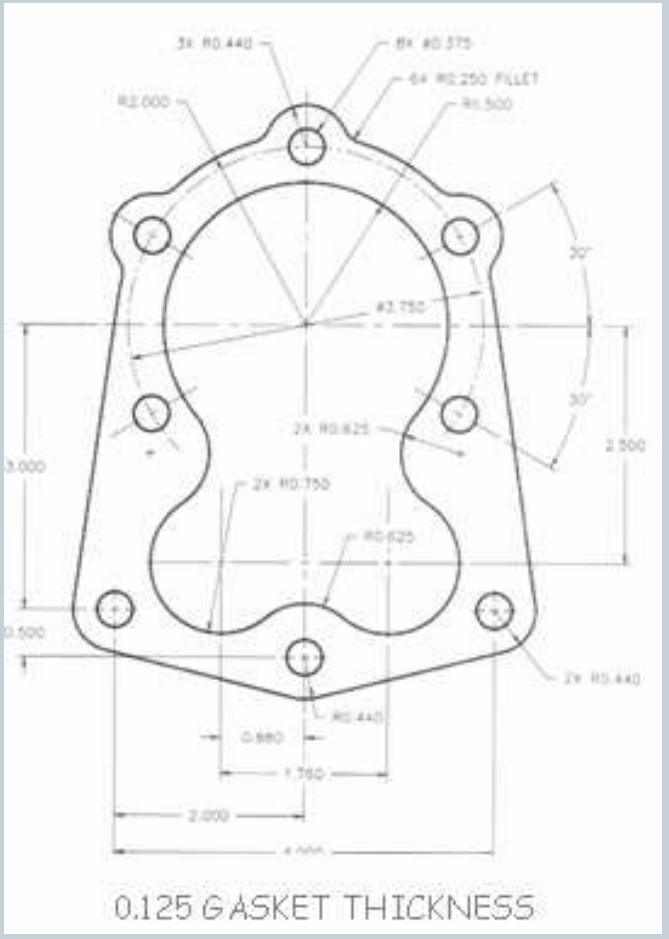
THREE-VIEW DRAWING



Multiview Drawings

One-view drawing

Parts made of flat sheet of material having uniform thickness, such as gaskets, washers and spacers, are represented with one view supplemented by a note describing their material and thickness.



Selection of Views

- Most objects can adequately be described by three orthographic views; usually the FRONT, TOP and SIDE views.
- Consideration should be given to the choice and number of views used so, when possible, the surfaces of the object are shown in their true size and shape.
- The exact number of views is dependent on the complexity of the object.

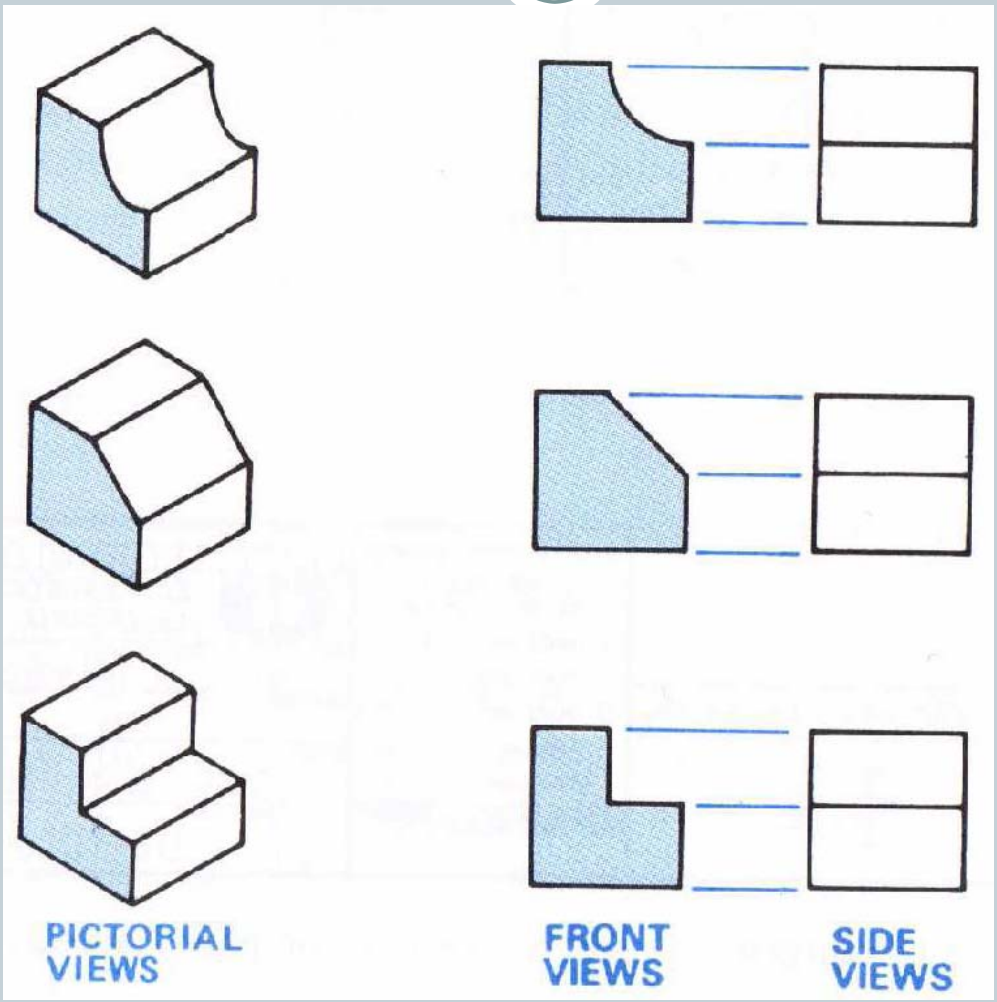
Guidelines to select and present the orthographic views

1. The front view should be the most natural position of use, if the object does not have a predefined front view. It is the most descriptive view with:
   - the longest dimension
   - the fewest hidden lines
   - the most stable position.
2. Select the sequence of views with the fewest hidden lines

Guidelines to select and present the orthographic views

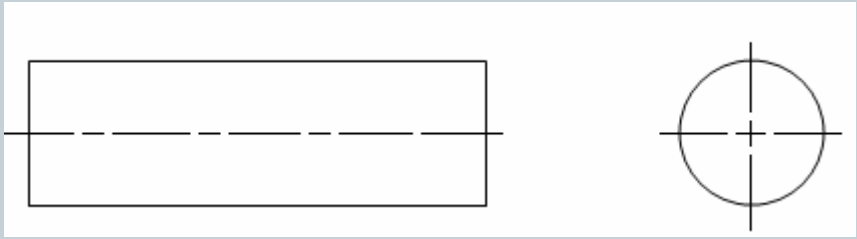
3. Use proper line types to express different features of the object.
   - Object or visible lines (thick continuous) to describe the visible surface or edge of the object.
   - Hidden or dotted lines to represent invisible features.
   - Centerlines are used to show and locate the centers of circles and arcs. Centerlines are also used to show the centre axis of a circular form.
   - As and when required, make use of other line types, such as Construction lines, Extension lines, Dimension lines. Follow the correct precedence sequence.
4. Label the views – for example, FRONT, TOP and SIDE
5. Leave adequate space between the views for labels and dimensions
6. Draw the views necessary to describe the object

Projection of Circular and Inclined Surfaces



Observe the contours and their projection shown

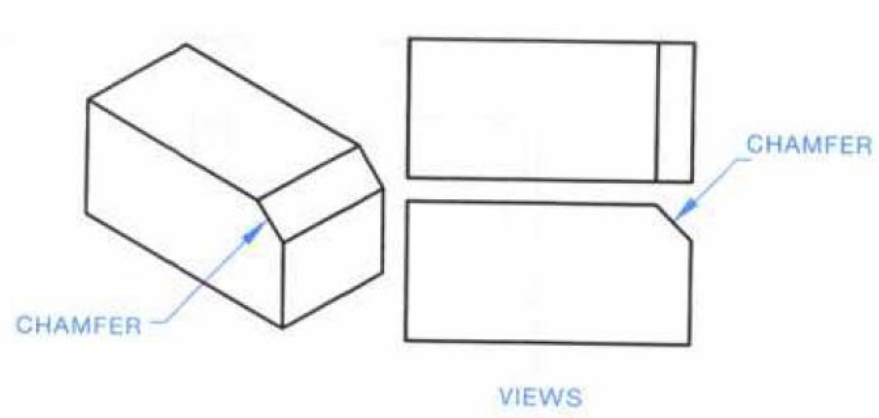
Cylindrical Shape

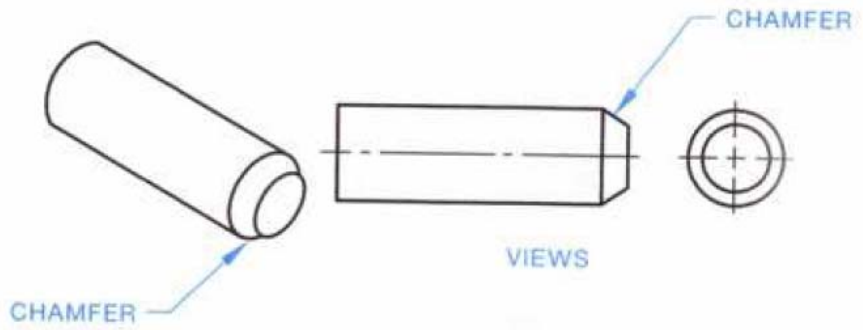


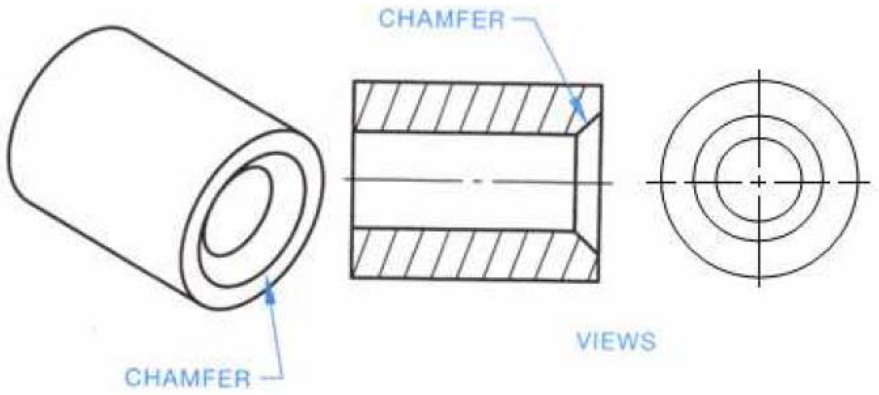
Orthographic view of cylindrical shape

Chamfers

- Chamfering refers to the process of cutting away the inside or outside corner of an object to remove sharp edges.
- Chamfers are provided to facilitate assembly.
- Chamfers are used as a slight angle to relieve a sharp edge.

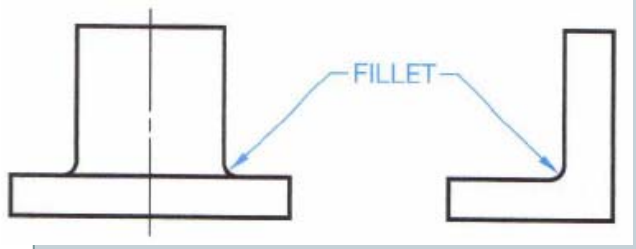


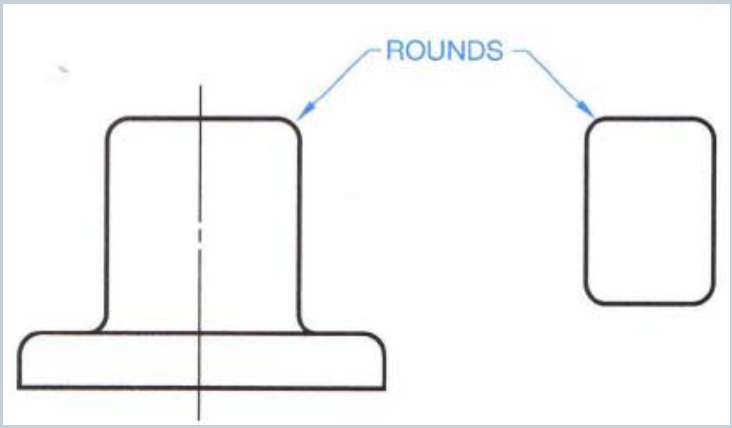


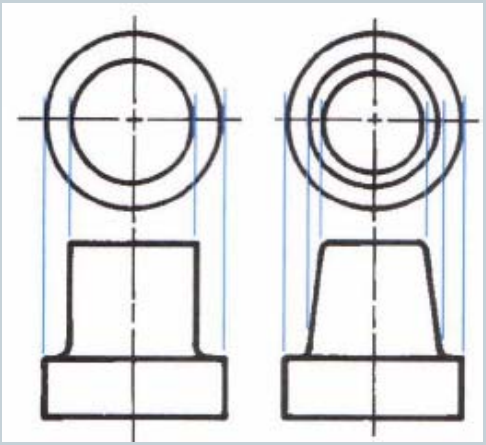


Fillets and rounds

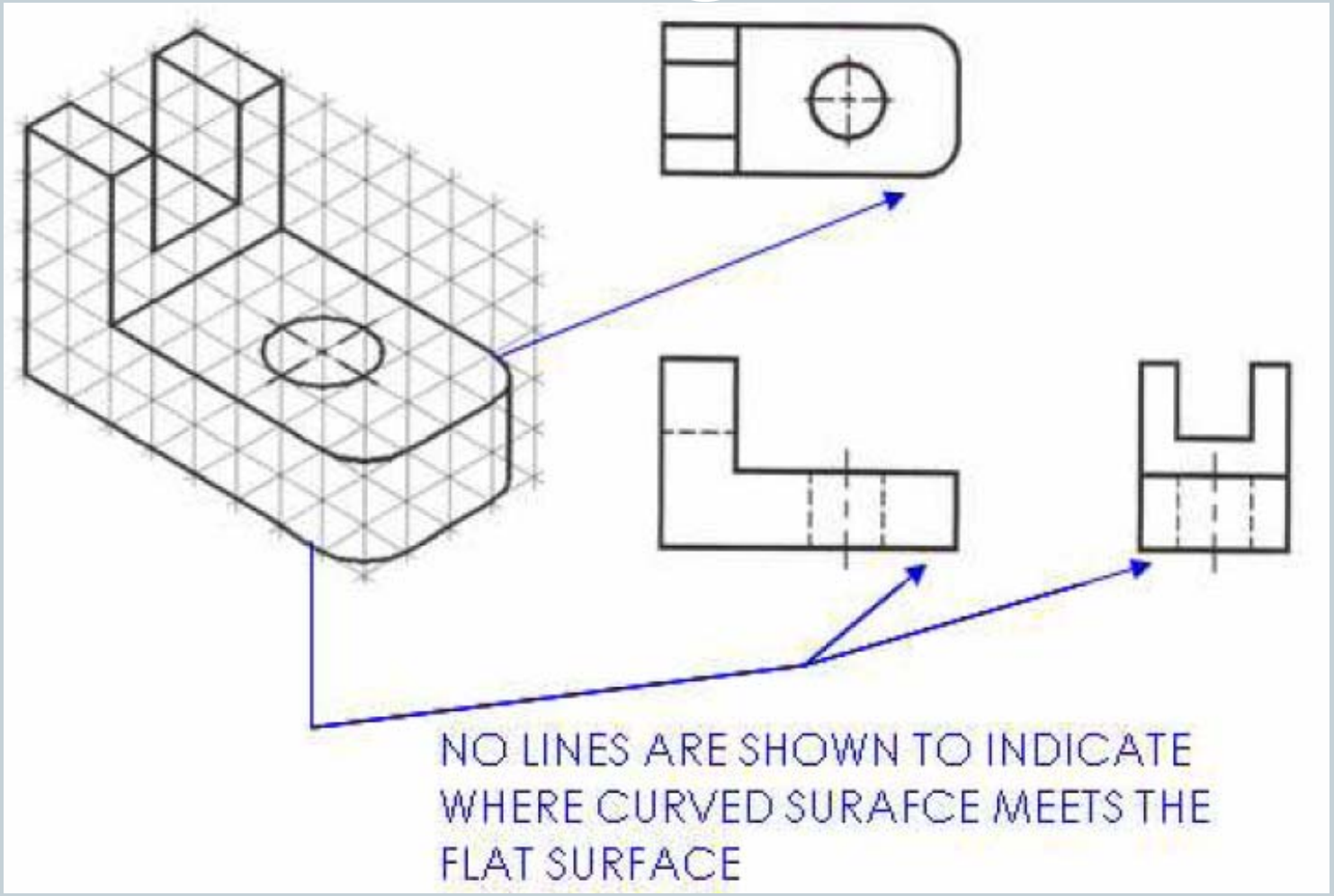
- Fillets and rounds are rounded intersections between the planes of a part that are generally used to ease machining corners or to allow patterns to release more easily from castings and forgings.
- A fillet is an inside rounding
- A round is an external rounding on part.







Fillets and rounds cont'd



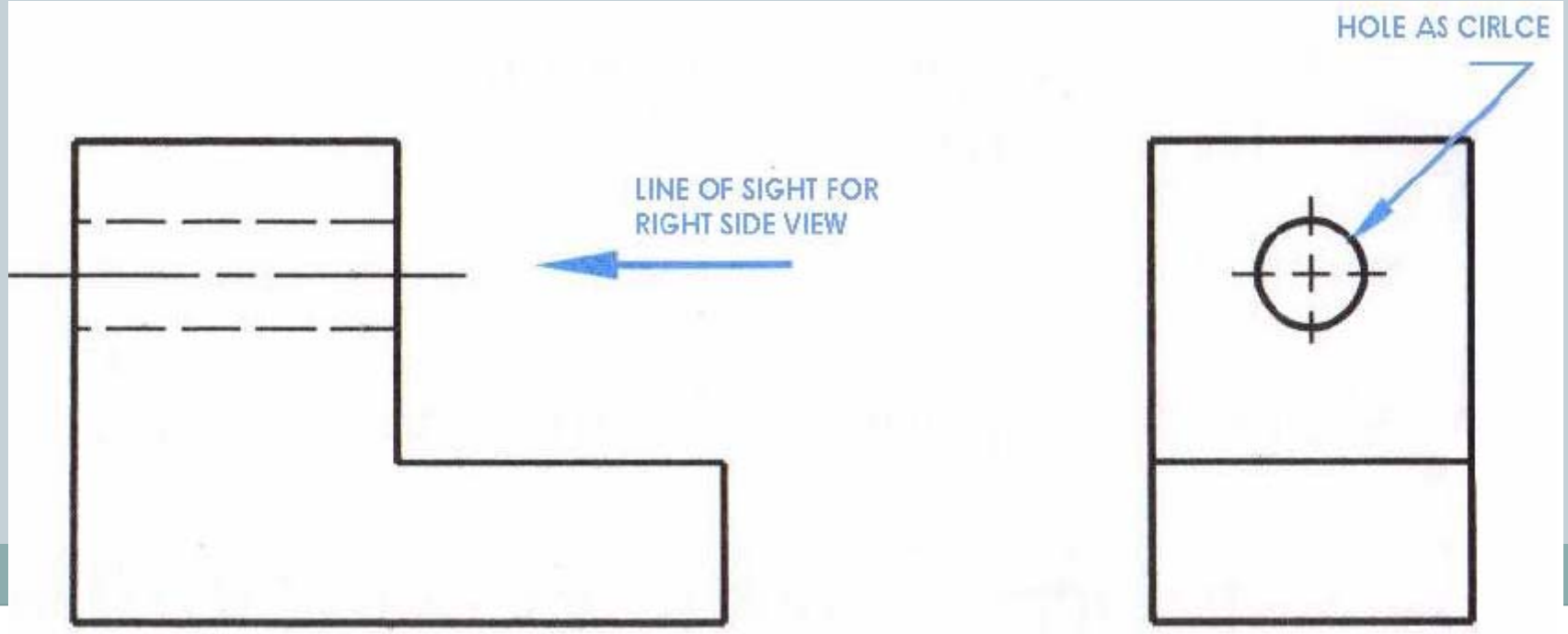
Observe how curved surface joins smoothly a flat surface

Circular features

- Circular features appear circular in one view only.

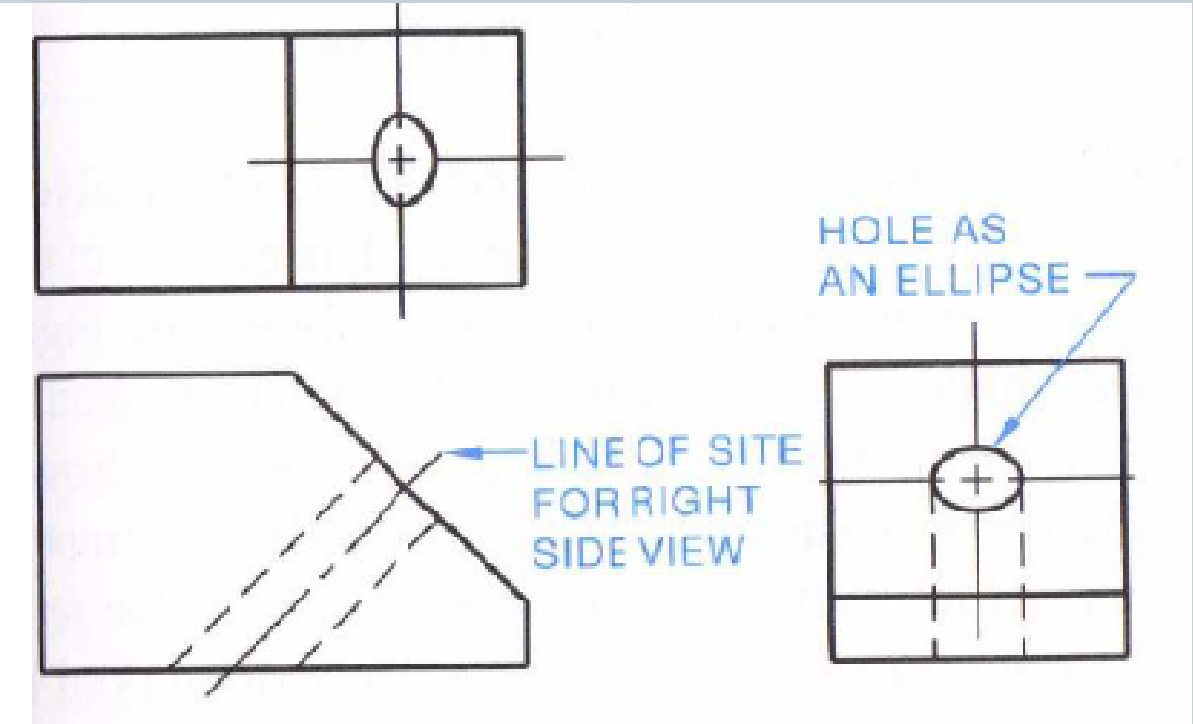
  Hidden circles, like hidden edges of flat surfaces, are represented on drawings by a hidden line.

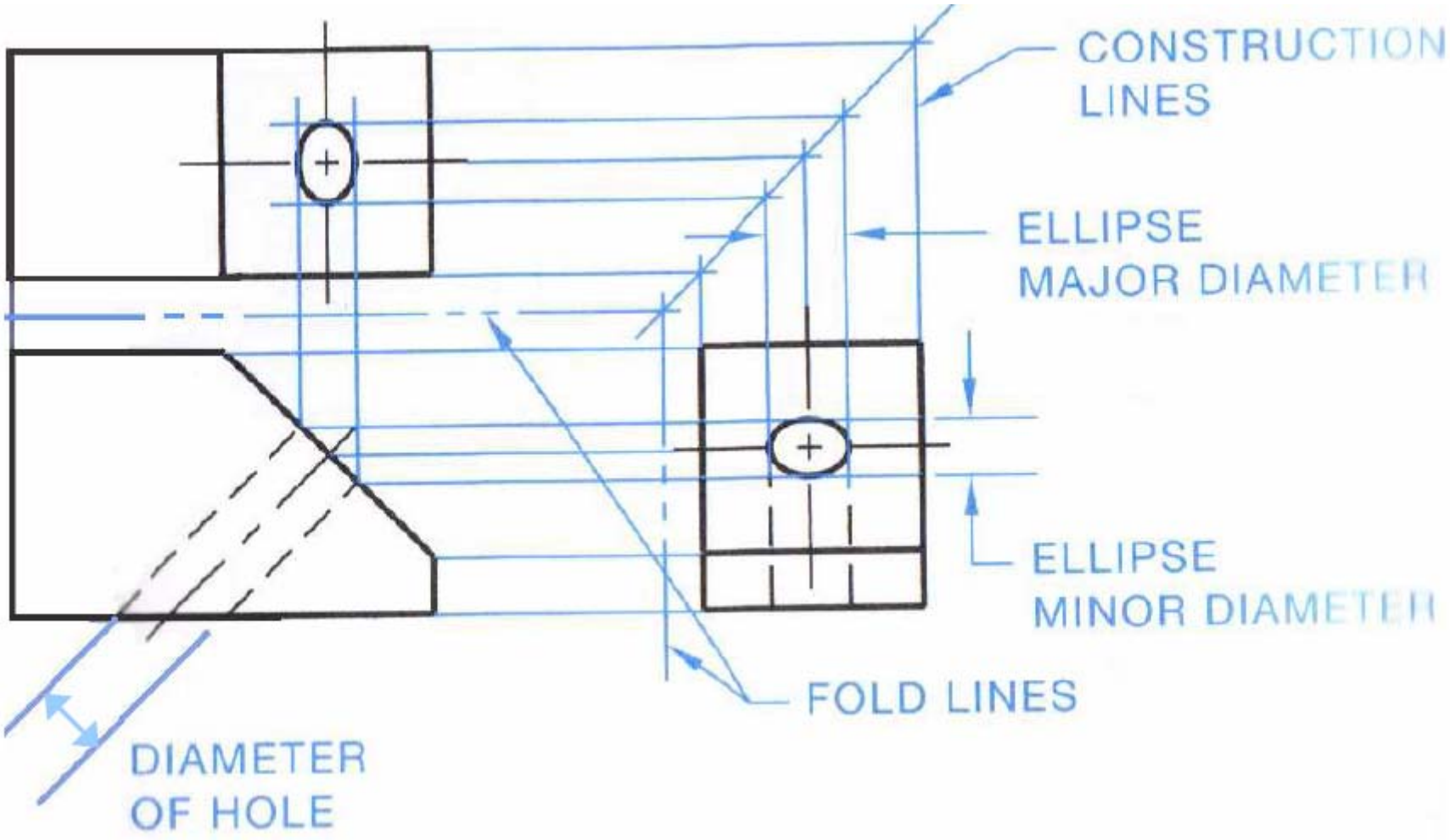
- Circular features, such as holes, appear round, if the line of sight is perpendicular to the circular feature.



Circular features on inclined surfaces

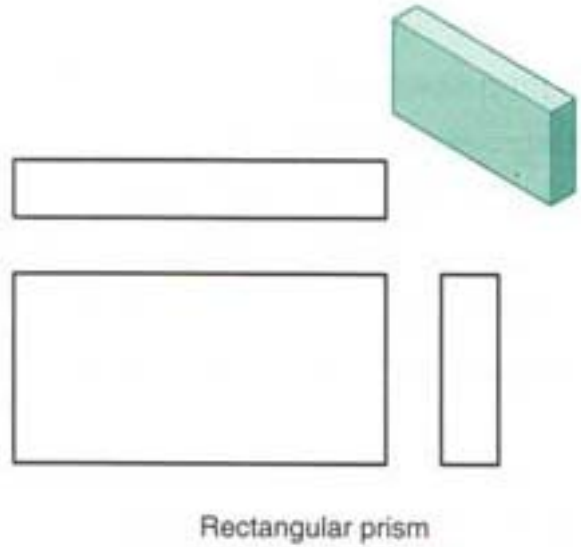
- Circular features on inclined surfaces appears as ellipse



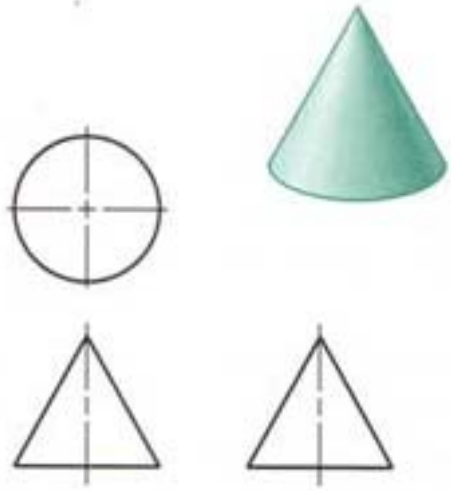


Creating ellipse using miter line

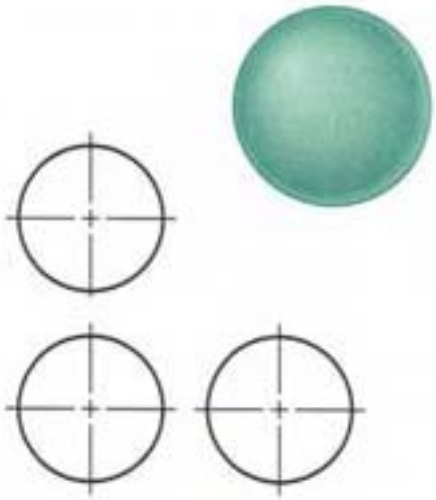
Examples of orthographic views of solid primitives



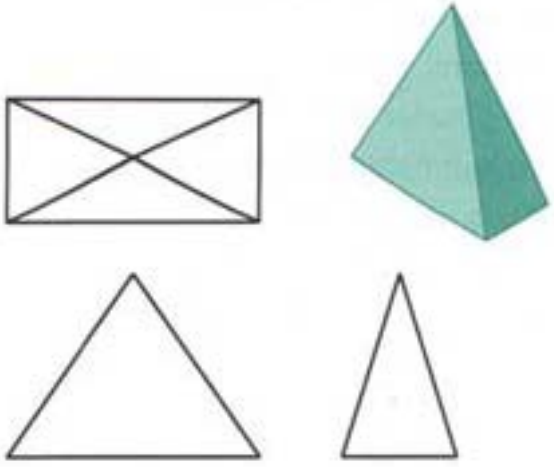
Rectangular prism



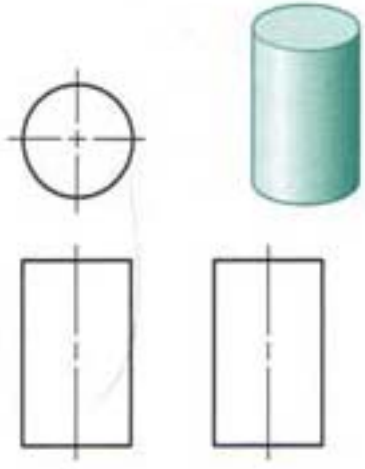
Cone



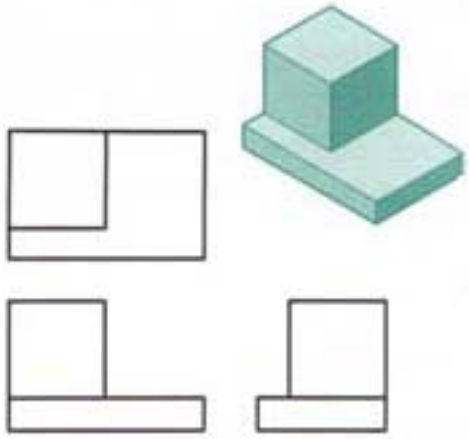
Sphere



Pyramid

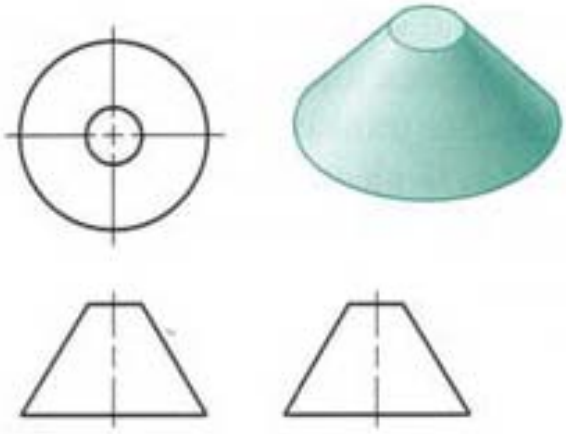


Cylinder

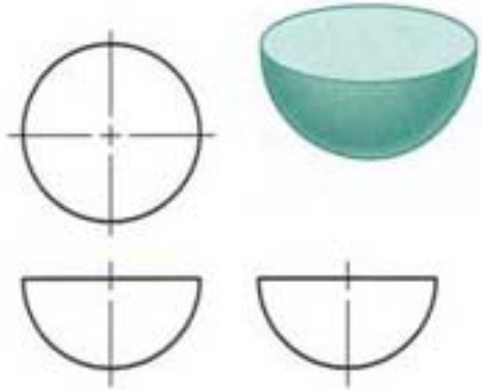


Prism and cube

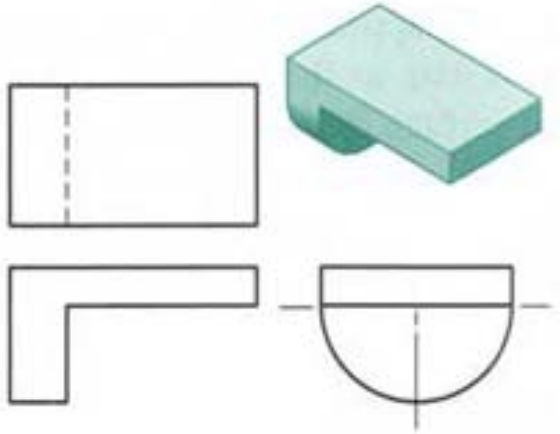
Examples of orthographic views of solid primitives



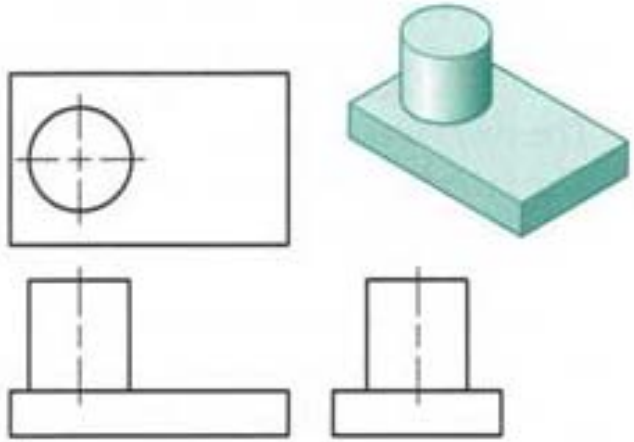
Truncated cone



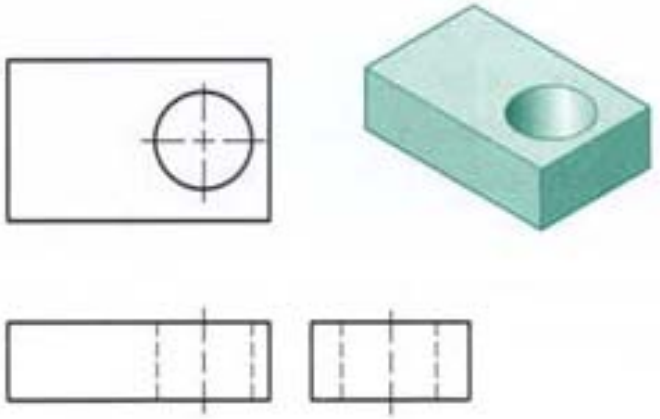
Partial sphere



Prism and partial cylinder



Prism and cylinder

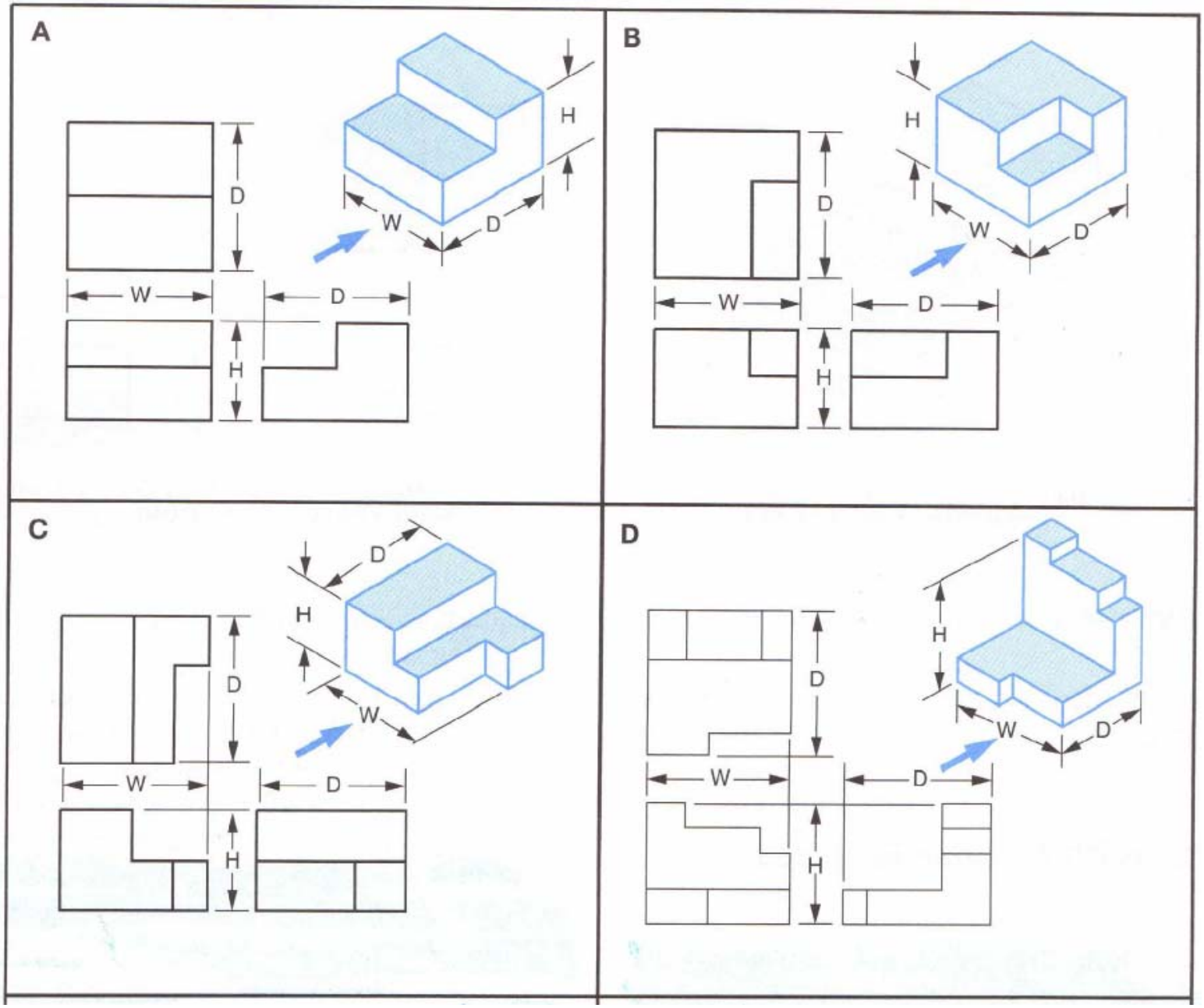


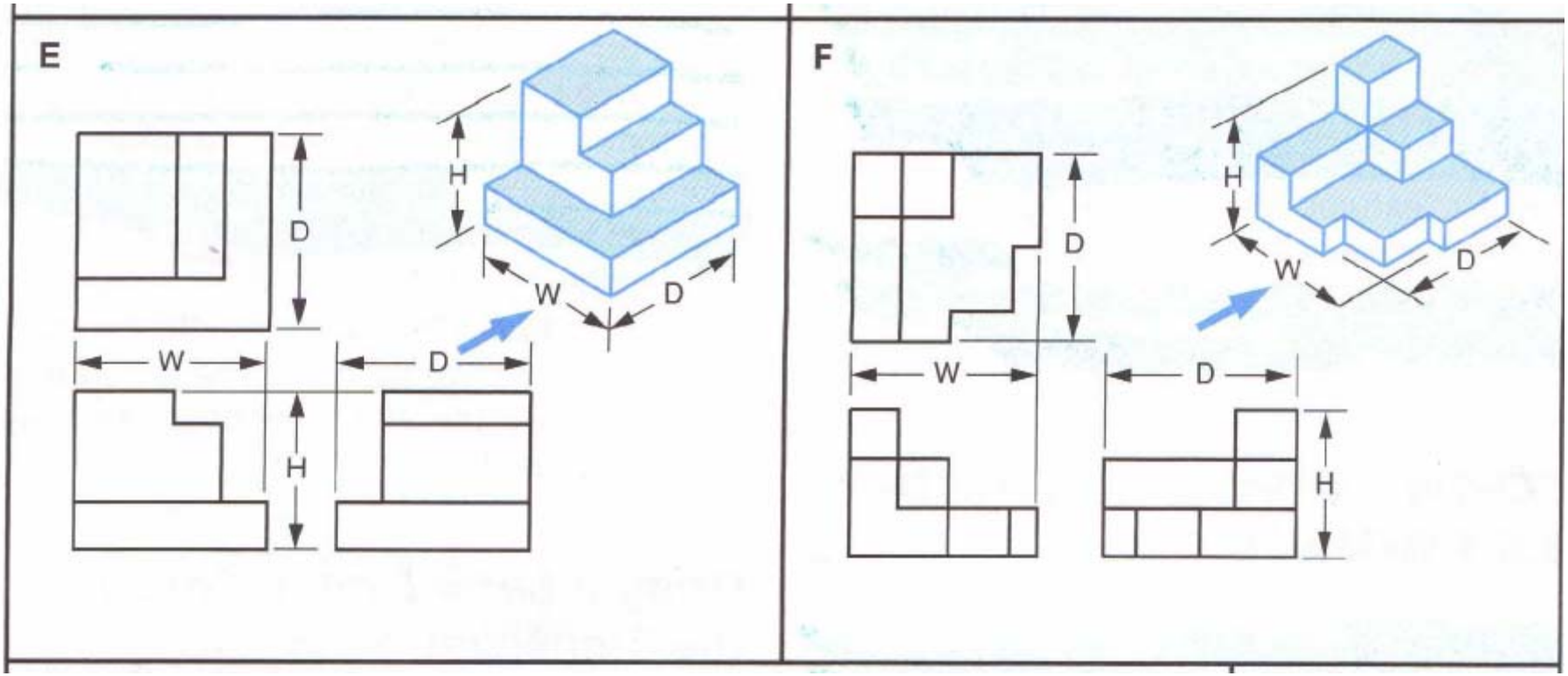
Prism and negative cylinder (hole)

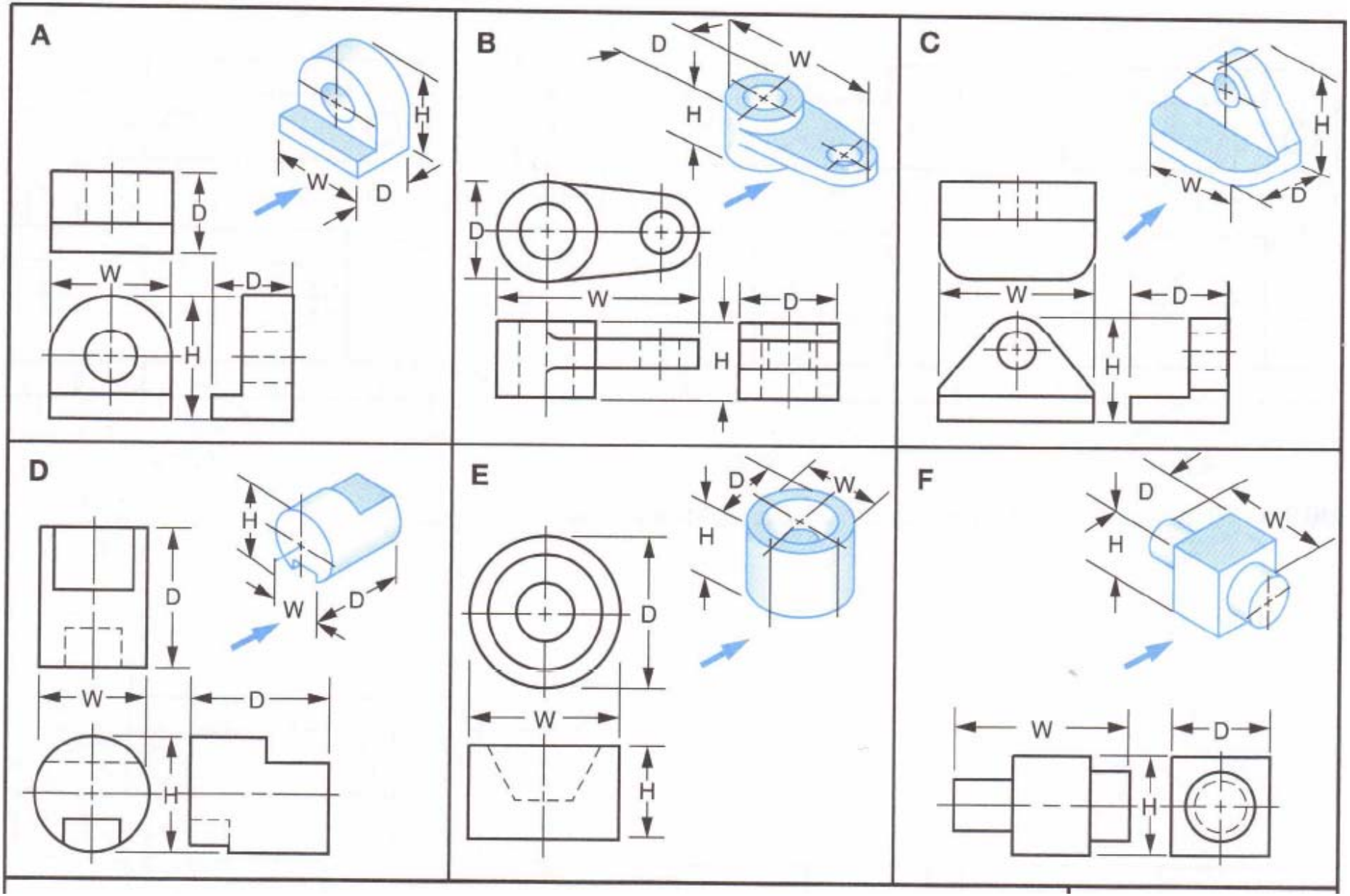
Examples of orthographic views of flat and circular surfaces

Note that

- *arrows indicate the direction of sight when looking at the front view*
- *All projections are in third-angle projection system*

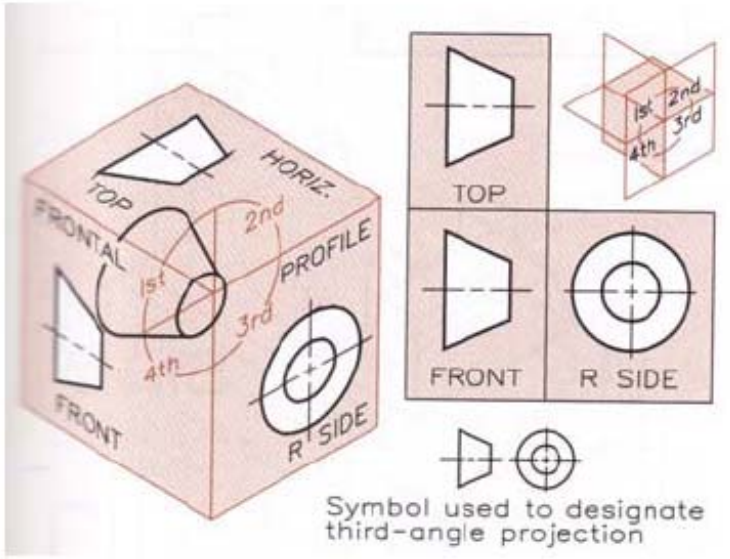

A
H
D
W
D
W
D
H
B
H
D
W
D
W
D
H
C
D
H
W
D
W
D
H
D
H
W
D
W
D
H


E
H
D
W
D
W
D
H
F
H
W
D
D
W
D
H

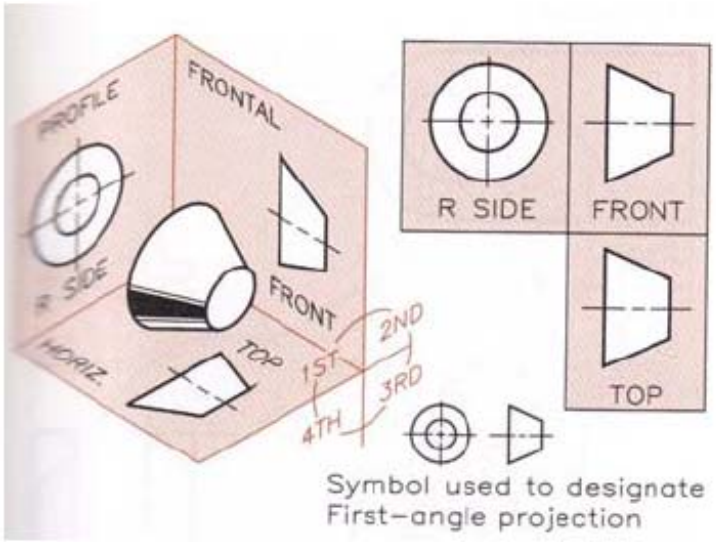

A
H
W
D
D
W
H
B
D
W
H
D
W
D
H
C
H
W
D
W
D
H
D
D
W
H
D
W
D
H
E
D
W
H
D
W
H
F
D
W
H
W
D
H

System of Projection Symbol

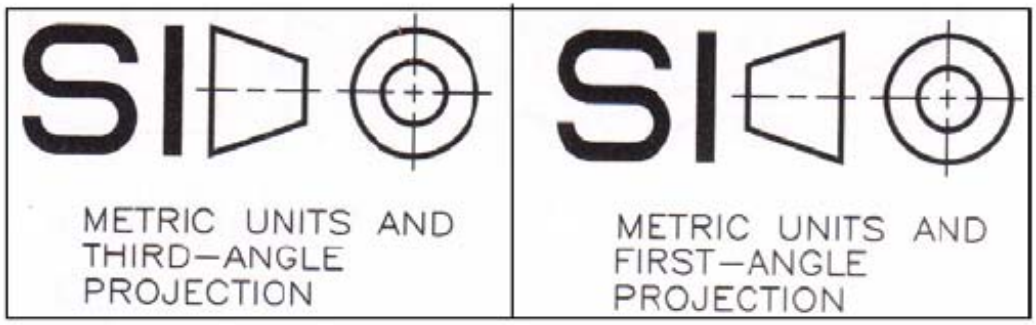
- There are some variations in the orientation of the projection symbol used in different text books and drawing documents.
- This is shown in the following slides



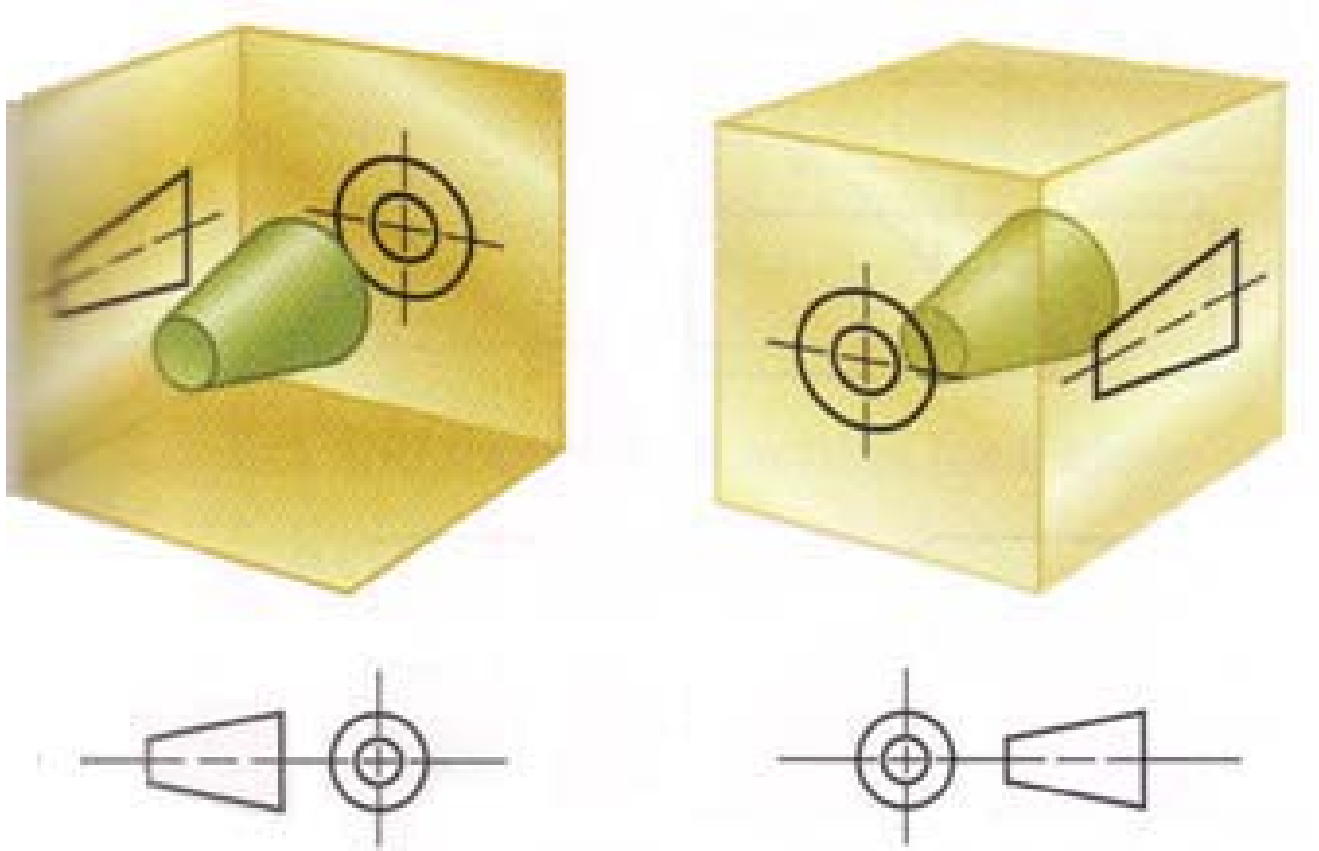
Third-angle projection: The top view is placed over the front view, and the right-side view is placed to the right of front view.



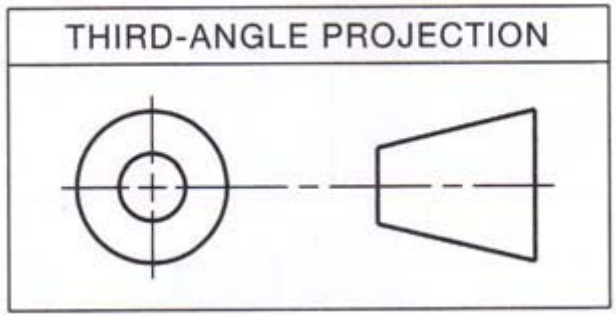
First angle projection: It shows the right-side view to the left of the front view and the top-view under the front view.

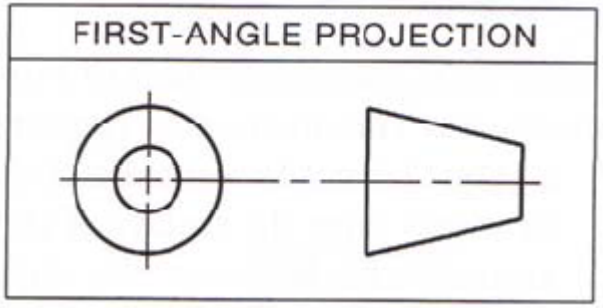


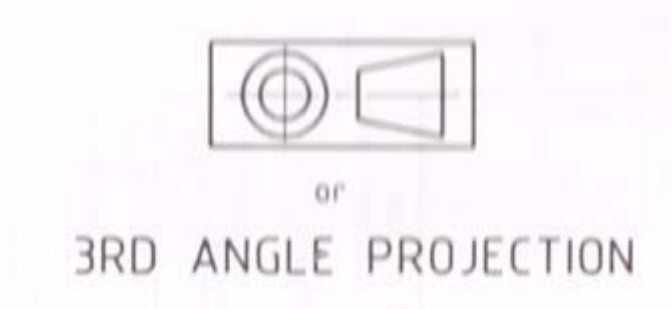
Ex 1. ISO symbols for third - and first - angle projection systems

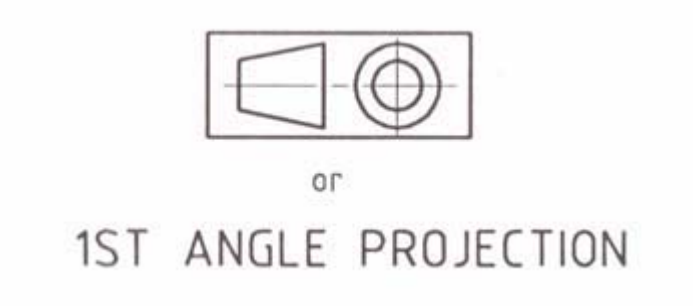


Ex 2. Drawing symbols for First- and Third-Angle Projection









Ex 2. Drawing symbols for First- and Third-Angle Projection

Thank you