ORTHOGONAL PROJECTIONS

ME111
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Orthographic Projections

- Orthographic Projections is a technical drawing in which different views of an object are projected on different reference planes observing perpendicular to respective reference plane.

- Different Reference planes are;
  - *Horizontal Plane (HP)*
  - *Vertical Plane (VP)*
  - *Side or Profile Plane (PP)*

- Different views are;
  - *Front View (FV) – Projected on VP*
  - *Top View (TV) – Projected on HP*
  - *Side View (SV) – Projected on PP*
NOTATIONS

Following notations should be followed while naming Different views in orthographic projections.

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>POINT A</th>
<th>LINE AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT’S TOP VIEW</td>
<td>a</td>
<td>a b</td>
</tr>
<tr>
<td>IT’S FRONT VIEW</td>
<td>a’</td>
<td>a’ b’</td>
</tr>
<tr>
<td>IT’S SIDE VIEW</td>
<td>a’’</td>
<td>a’’ b’’</td>
</tr>
</tbody>
</table>

Same system of notations should be followed incase numbers, like 1, 2, 3 – are used.

TERMS ‘ABOVE’ & ‘BELOW’ WITH RESPECT TO H.P.
AND TERMS ‘INFRONT’ & ‘BEHIND’ WITH RESPECT TO V.P.
Types of views

- Projections
  - Parallel
    - Orthogonal
      - Multiview drawing
    - Oblique
      - Axonometric
        - Pictorial drawing
  - Converge
    - Perspective drawing
## View comparison

<table>
<thead>
<tr>
<th>Type</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-view drawing</td>
<td>- Accurately presents object’s details, i.e. size and shape.</td>
<td>- Require training to visualization.</td>
</tr>
<tr>
<td>Pictorial drawing</td>
<td>- Easy to visualize.</td>
<td>- Shape and angle distortion</td>
</tr>
<tr>
<td>Perspective drawing</td>
<td>- Object looks more like what our eyes perceive.</td>
<td>- Difficult to create</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Size and shape distortion</td>
</tr>
</tbody>
</table>

- **Circular hole becomes ellipse**
- **Right angle becomes obtuse angle.**

- Distorted width

- Accurately presents object’s details, i.e. size and shape.
- Easy to visualize.
- Object looks more like what our eyes perceive.
- Require training to visualization.
- Shape and angle distortion
PRINCIPAL PLANES
HP AND VP

AUXILIARY PLANES

Auxiliary Vertical Plane (A.V.P.)

Auxiliary Inclined Plane (A.I.P.)

Profile Plane (P.P.)
THIS IS A PICTORIAL SET-UP OF ALL THREE PLANES. ARROW DIRECTION IS A NORMAL WAY OF OBSERVING THE OBJECT. BUT IN THIS DIRECTION ONLY VP AND A VIEW ON IT (FV) CAN BE SEEN. THE OTHER PLANES AND VIEWS ON THOSE CAN NOT BE SEEN.

PROCEDURE TO SOLVE ABOVE PROBLEM:-

TO MAKE THOSE PLANES ALSO VISIBLE FROM THE ARROW DIRECTION,
A) HP IS ROTATED 90° DOWNWARD
B) PP, 90° IN RIGHT SIDE DIRECTION.
THIS WAY BOTH PLANES ARE BROUGHT IN THE SAME PLANE CONTAINING VP.

On clicking the button if a warning comes please click YES to continue, this program is safe for your pc.
Projection systems

1. **First** angle system
   - European countries
   - ISO standard

2. **Third** angle system
   - Canada, USA, Japan, Thailand
Orthographic views

1st angle system
(Opaque planes)

3rd angle system
(transparent planes/glass box)
Orthographic views

1st angle system

3rd angle system

Folding line

Folding line

Folding line

Folding line
Views arrangement

1st angle system

3rd angle system

Right Side View

Front View

Top View

Front View

Right Side View

Top View
Projection symbols

1\textsuperscript{st} angle system

3\textsuperscript{rd} angle system
Methods of Orthogonal Projection

1. Natural Method: Revolve the object with respect to observer

2. Glass box method: The observer moves around the object.
Glass box: Revolution of the planes of projection

- Rear view
- Left side view
- Bottom view
Relative orientation of views

Top view

Front view

Rear view

Left side view

Right side view

Bottom view

Depth

Width

Height
Summary: Problem solving steps

1. Given
2. Analyze
3. Plan
4. Execute
Steps for Orthographic Views

1. Select the necessary views
2. Layout the selected views on a drawing sheet.
3. Complete each selected views.
4. Complete the dimensions and notes.

Choose a drawing scale (say 1:1)
View selection procedures

1. Orient the object to the best position relative to a glass box.

2. Select the front view.

3. Select adjacent views.
Suggestions: Orient the object

1. The object should be placed in its natural position.
2. The orthographic views should represent the true size and true shape of an object (as much as possible).
Suggestions: Select the front view

1. The **longest** dimension of an object should be presented as a **width** (in a front view).

First choice: **Inappropriate**

Second choice: **Good**

Use more space
Suggestions: Select the front view

2. The adjacent views project from the selected front view should be appeared in a natural position.
Suggestions: Select the front view

3. It has the fewest number of hidden lines.
Suggestions: Select an adjacent view

1. Choose the view that has the fewest number of hidden lines.
2. Choose the **minimum** number of views that can represent the major features of the object.

**Suggestions:** Select an adjacent view

All information is placed on a single view.

Hole’s information is placed on a separated view.

Necessary

Necessary
3. Choose the views that are suitable to a drawing sheet.

**Suggestions:** Select an adjacent view

Choose another adjacent view.  
Change orientation of the selected views.
View selection has 3 steps

- Orient the object
- Select front view
- Select adjacent views
Object that requires only one-view

- **Flat (thin) part** having a uniform thickness such as a gasket, sheet metal etc.
- **Cylindrical-shaped** part.

Example

Adjacent views provide only a part’s thickness!
Object that requires only **one-view**

- Flat (thin) part having a uniform thickness such as a gasket, sheet metal etc.
- **Cylindrical-shaped** part.

Example

![Example Diagram](image1)

Repeat !

Infer from CL

Example
Object that requires only **two-view**

- Identical adjacent view exists.
- The 3\(^{rd}\) view has no significant contours of the object. *(provides no additional information)*

**Example**

![Diagram of an object with three views: front, side, and top views. The side view is marked with a red border, indicating it should be repeated.](image)
Object that requires only two-view

- Identical view exists.
- The 3rd view has no significant contours of the object.
  (provides no additional information)

Example 1
Object that requires only two-view

- Identical view exists.
- The 3rd view has no significant contours of the object.
  (provides no additional information)

Example 2
Steps to draw projections

- Identify surfaces perpendicular or inclined to the view.
- Surfaces parallel to the view would not be visible in that view.
- First draw horizontal and vertical reference planes (easily identifiable on drawing).
- Start drawing from the reference planes.
PICTORIAL PRESENTATION IS GIVEN

DRaw THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

Example-2

ORTHOGRAphic PROJECTIONS

FRONT VIEW

L.H.SIDE VIEW

TOP VIEW
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD
PICTORIAL PRESENTATION IS GIVEN

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DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD
PICTORIAL PRESENTATION IS GIVEN

DRAW FV AND TV OF THIS OBJECT

BY FIRST ANGLE PROJECTION METHOD
Example-8

PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD
Example-9

PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

ORTHOGONAL PROJECTIONS

ALL VIEWS IDENTICAL

FV

SV

FOR T.V.

FOR S.V.

FOR F.V.

10

40

60

40

60

TV

x

y
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

ORTHOGRAPHIC PROJECTIONS
ALL VIEWS IDENTICAL

FV

SV

40
60
10
40
60

TOP VIEW

Example-10
PICTORIAL PRESENTATION IS GIVEN
DRAW FV AND TV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

Example-11

FOR T.V.

ORTHOGRAPHIC PROJECTIONS

FV

TOP VIEW

FOR F.V.

TV

X

Y
Example - 12

Orthographic projections

Pictorial presentation is given
draw FV and TV of this object
by first angle projection method
PICTORIAL PRESENTATION IS GIVEN

DRAW FV AND LSV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD
Example-14

PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD