


**ADDIS ABABA SCIENCE AND TECHNOLOGY UNIVERSITY**  
**College of Electrical and Mechanical Engineering**  
**Department of Mechanical Engineering**  
**COURSE :ENGINEERING DRAWING [Meng1011]**  
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## CHAPTER 2

### THEORY OF PROJECTION



### TOPICS

- INTRODUCTION
- CLASSIFICATION OF PROJECTION
- PROJECTION OF POINTS
- PROJECTION OF LINES
- PROJECTION OF PLANES



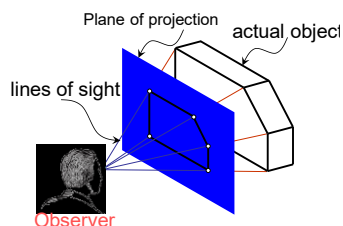
### 1.1. INTRODUCTION



#### Introduction...

- A **projection** is a drawing or representation of an entity on an **imaginary plane** or planes
- A projection involves four components

- The **actual object**
- **Observer looking at the object**
- **Imaginary projection plane**
- **Imaginary lines of sight**



#### Introduction...

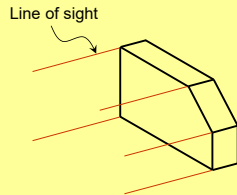
- The projection theory is used to graphically represent 3-D objects on 2-D media (paper, computer screen).
- The projection theory is based on two variables:
  - **Line of sight**
  - **Plane of projection** (image plane or picture plane)

## Introduction...

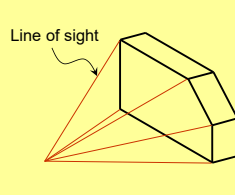
**Line of sight** is an imaginary ray of light between an **observer's eye** and an **object**.

- There are 2 types of LOS : **Parallel** and **Converge**

### Parallel projection



### Perspective projection

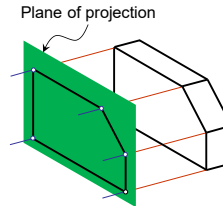


## Introduction...

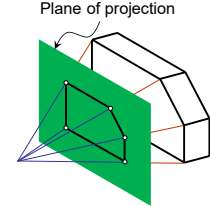
**Plane of projection** is an imaginary flat plane which the image is created.

- The image is produced by connecting the points where the LOS pierce the projection plane.

### Parallel projection



### Perspective projection

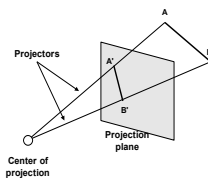


## Introduction...

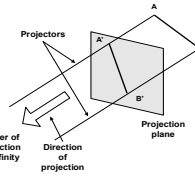
- The two broad types of projections are: **parallel projection** and **perspective projection**.

- Key factor is the **center of projection**: if distance to center of projection is

**Finite**: Perspective projection    **Infinite**: Parallel projection



Perspective projection



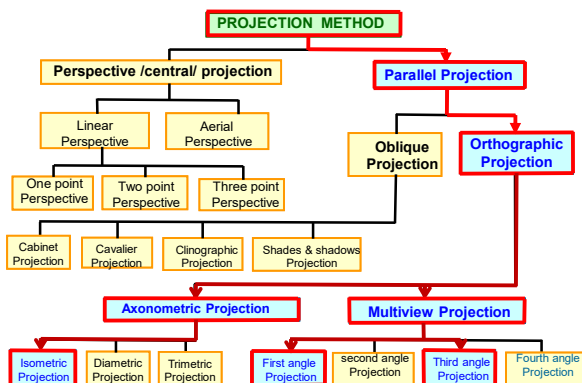
Parallel projection

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## 2.2. CLASSIFICATION OF PROJECTION



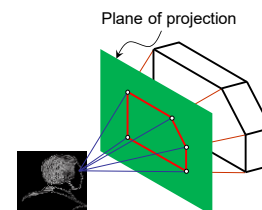
## CLASSIFICATION OF PROJECTION



## CLASSIFICATION OF PROJECTION

### 1. Perspective Projections

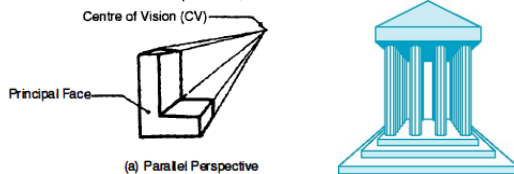
- PPs are drawings which attempt to replicate what the human eye actually sees when it views an object.
- There are three types of perspective projections: **One-point**, **Two-point** and **Three-point** projections



## CLASSIFICATION OF PROJECTION

### 1.1. One point perspective projection

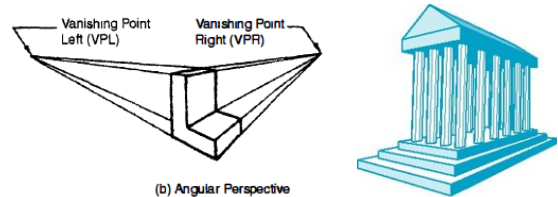
- If the **principal face of the object** viewed, is **parallel to the picture plane**, the perspective view formed is called **parallel perspective** /one point perspective/.
- The horizontal lines receding the object converge to a single point called vanishing point (V.P.)
- Generally used to present the interior details of a room, interior features of various components, etc.



## CLASSIFICATION OF PROJECTION

### 1.2. Two-point perspective projection

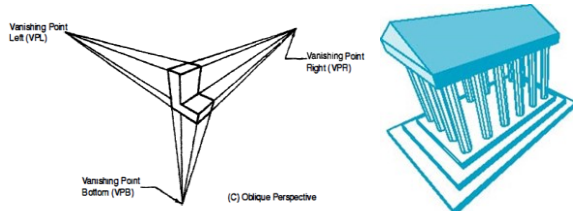
- If the **two principal faces** of the object viewed are **inclined to the picture plane**, the perspective view formed is called **angular perspective** /two point perspective/.
- This is often used in architectural, engineering and industrial design drawings



## CLASSIFICATION OF PROJECTION

### 1.3. Three point perspective projection:

- If all the **three mutually perpendicular principal faces** of the object viewed, are **inclined to the picture plane**, the perspective view formed is called **oblique perspective** /three point perspective /.
- Used to draw pictorial views of huge and tall objects like tall buildings, towers, structures, etc.



## CLASSIFICATION OF PROJECTION

### Disadvantage of Perspective Projection

- Perspective projection is **not** used by engineer for manufacturing of parts, because
  - It does not reveal **exact shape and size**.
  - It is difficult to **create**.

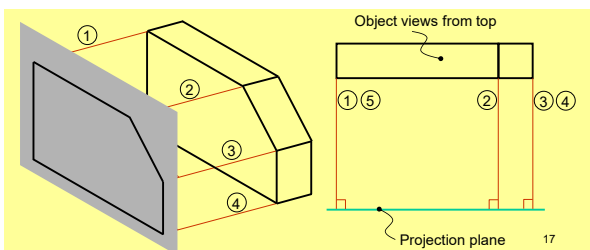


## CLASSIFICATION OF PROJECTION

### 2.Parallel Projection

- It is subdivided in to the following two categories: **Orthographic & Oblique projections**

**2.1. Orthographic projection** is a parallel projection technique in which the parallel lines of sight are perpendicular to the projection plane.



## CLASSIFICATION OF PROJECTION

- **Orthographic projection** technique can produce either

**2.1.1.Multiview drawing** : that each view show an object in two dimensions. / chapter 3/

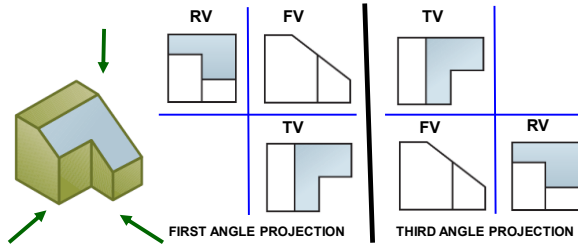
**2.1.2.Axonometric drawing** : that show all three dimensions of an object in one view /chapter 4/.

- Both drawing types are used in technical drawing for communication.

## CLASSIFICATION OF PROJECTION

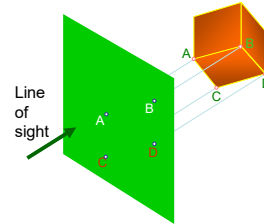
**2.1.1. Multiview drawing** : technique can produce either 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> angle projection

But this course focus on 1<sup>st</sup>, and 3<sup>rd</sup> angle projection



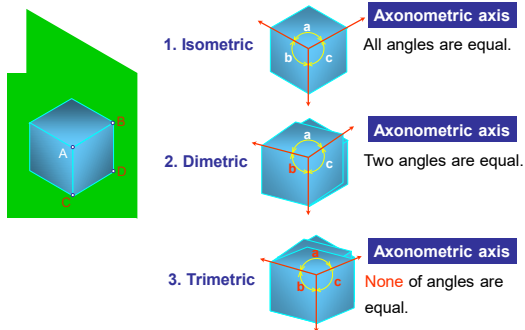
## CLASSIFICATION OF PROJECTION

### 2.1.2. Axonometric Projection



## CLASSIFICATION OF PROJECTION

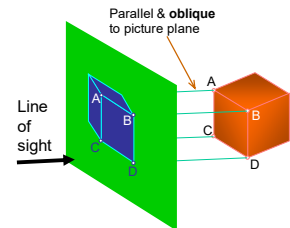
### Type of axonometric drawing



## CLASSIFICATION OF PROJECTION

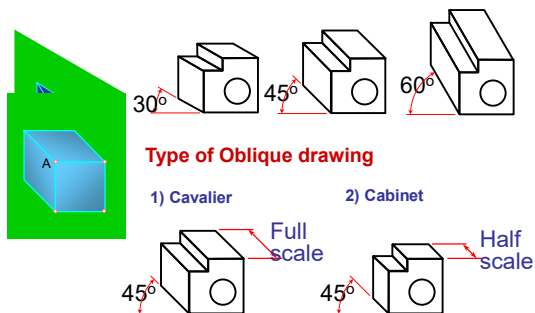
### 2.2. Oblique projections

- ☐ Actually show the full size of one view.
- ☐ When one face of the object is kept parallel to the plane and the other adjacent face is inclined at  $45^\circ$  to the plane.
- ☐ Two axes are perpendicular to each other and the third is drawn either at  $30^\circ$  or  $45^\circ$  to the horizontal.



## CLASSIFICATION OF PROJECTION

### Oblique drawing angle



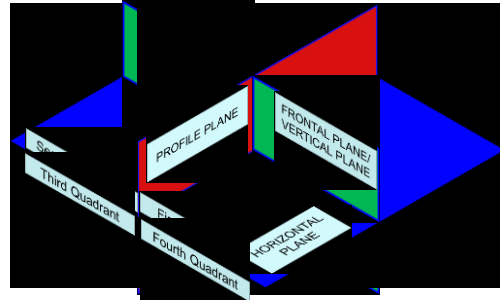
## 2.3. PROJECTION OF POINT(S)



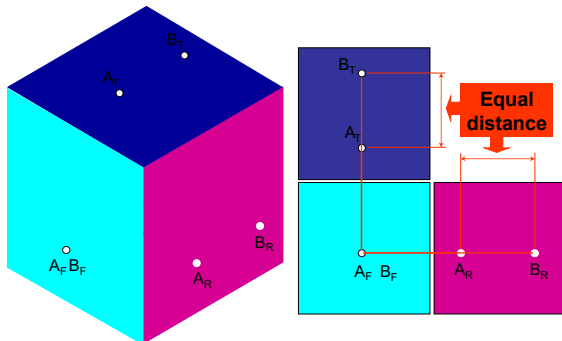
## PROJECTION OF POINT(S)

- A **plane of projection (POP)** is a plane on which a particular view is projected.
- Three such planes, perpendicular to each other, are called **principal planes or reference planes (RP)**.
  - When the observer looks at the object from the front, the view obtained is called the **front view or elevation** and is seen on the **vertical plane (VP)/ frontal plane (FP)**.
  - When the observer looks at the object from above, the view obtained is called **top view or plan** and is seen on the **horizontal plane (HP)**.
  - When the observer looks at the object from side, i.e., from his left-hand side or right-hand side, the view obtained is called **side view** and is seen on the **profile plane (PP)**.

## PROJECTION OF POINT(S)



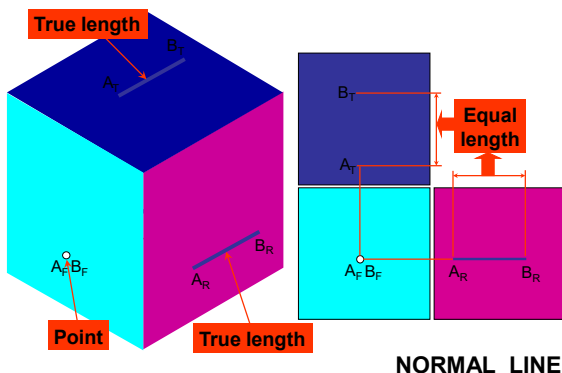
## PROJECTION OF POINT(S)



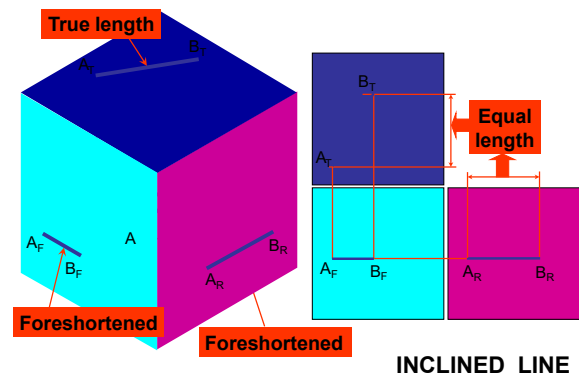
## 2.4. PROJECTION OF LINES



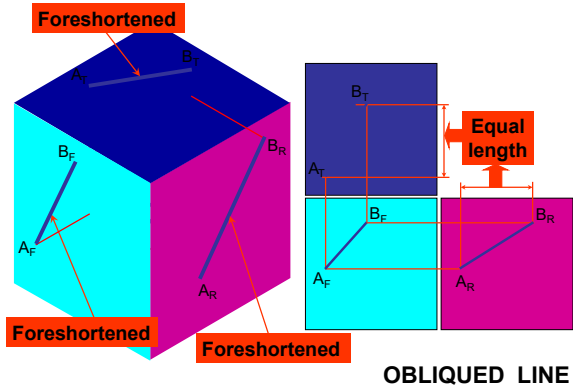
## PROJECTION OF LINES



## PROJECTION OF LINES



## PROJECTION OF LINES



## 2.5. PROJECTION OF PLANES

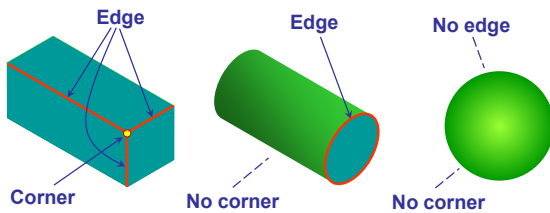


## PROJECTION OF PLANES

### OBJECT FEATURES

**Edges** are lines that represent the boundary between two faces.

**Corners** Represent the intersection of two or more edges.

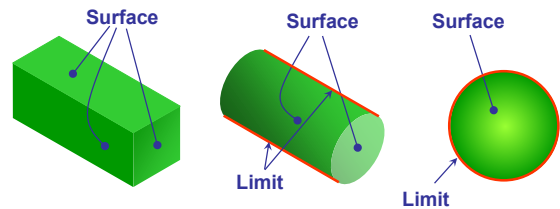


## PROJECTION OF PLANES

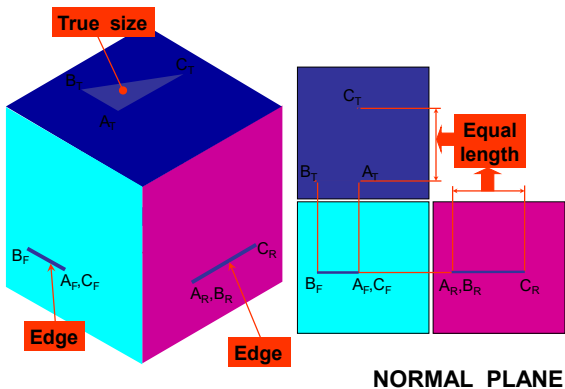
### OBJECT FEATURES

**Surfaces** are areas that are bounded by edges or limiting element.

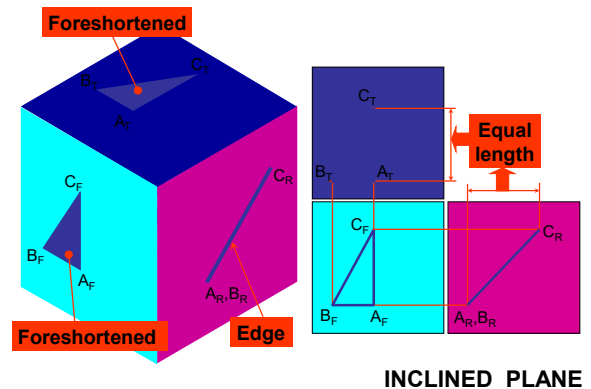
**Limiting element** is a line that represents the last visible part of the curve surface.



## PROJECTION OF PLANES



## PROJECTION OF PLANES



## PROJECTION OF PLANES

