436-105 Engineering Communications

GL11: Descriptive Geometry

- Elements
- Primary auxiliary views
- Rotations
Elements of DG

- Orthographic projection
  - parallel projectors

Front (plane 2)
Top (plane 1)

Projection of line AB on plane 1
Projection of line AB on plane 2

Fold line 1-2 (or reference line)
Elements of DG

- Geometric elements
  - points
  - lines
  - planes

- Relationships
  - angles
  - distances
Point Line Plane

1

2

2 3

a₁ b₁ c₁

a₂ b₂ c₂

a₃ b₃ c₃
Fundamental views

- **Lines**
  - seen in **true length** (TL) if **parallel** to projection plane
  - seen as a **point** if **perpendicular** to projection plane
  - an **inclined** line is seen in TL in one principal view
  - an **oblique** line is foreshortened in all principal views
Fundamental views

- Planes
  - seen in **true shape** (TS) if parallel to projection plane
  - seen as a **line** if perpendicular to projection plane
  - an **inclined** plane is seen as a line (edge view) in one standard view
  - an **oblique** plane is ‘similar’ in all standard views
Summary of fundamental views

Geometry

Lines:
• Point View
• True Length (TL) view

Planes:
• Edge View
• Dihedral angle view
• True Shape (TS) view

Projection plane

• ⊥ to line
• // to line
• ⊥ to plane
• // to plane
Auxiliary views

- Often an object has significant features inclined to the principal projection planes

- Primary auxiliary view
  - projection on to an auxiliary plane which is orthogonal to one of the principal projection planes

- Secondary auxiliary view
  - the auxiliary plane is inclined to all the principal projection planes
Review

• Principal views
  – projections onto principal planes of the orthographic box (top, front, left side, right side, back, bottom)
  – placed on one sheet of paper by unfolding top and sides about fold (or hinge) lines

• Primary auxiliary view
  – projection onto an auxiliary plane which is orthogonal to a principal plane of the orthographic box
  – placed on drawing sheet by unfolding about fold (or hinge) line

• Reference lines
  – represent edge views of projection planes (fold lines, or hinge lines)

• Adjacent views
  – share a common reference line; hence are orthogonal to each other

• Related views
  – share a common adjacent view (e.g., top and side views are related because they are both adjacent to the front view)
  – points in related views are at the same distance from their respective reference lines
Rotation of elements to find true size

- To find true size we can:
  - introduce an auxiliary projection plane parallel to the element of interest (a line or plane), or
  - rotate the element until it is parallel to a principal plane
True length of a line by rotation

Axis of rotation
Exam question
Semester 1, 1998

Find TL and angle of guy wires to the ground
1. PA by auxiliary view
2. PB by rotation
Simple shadow problem:
Find true size and shape of shadow cast by B on A
Another shadow problem:
What is true size of shaded region of roof on A?

1. Find shadow limits
2. Edge view of roof plane
   (primary aux. plane 4 _|_ ridge)
3. Secondary aux. plane 5
   parallel to roof plane
Follow up

• Read Bertoline:
  – Ch 11: Auxiliary views
  – Ch 12: Fundamentals of descriptive geometry

• Do problems from Bertoline:
  – Probs 11.1(1)(6), 12.7-10