Sections through assemblies
Pay attention to lining
Pay attention to representation

(C) Correct!

(A) Incorrect!

(B) Correct!
Pay attention to representation

(A) True projection

(B) Preferred
Pay attention to representation

Spoke A omitted in the "preferred" section view

True Projection

Preferred
Section in a flange
AUXILIARY VIEWS
Definitions

- Any view obtained by a projection on a plane other than the horizontal (H), frontal (F) and profile (P) is an auxiliary view.
- **Primary auxiliary** is projected to a plane that is perpendicular to one of the principal planes.
- **Secondary auxiliary** is projected from a primary auxiliary to a plane that is inclined to all three principal views.
Candidates for auxiliary views

Isometric lines

Non-isometric lines

Isometric axis
Auxiliary view
Principal planes
Auxiliary plane
Primary auxiliary view

Plane  True Dim.

F – Width, Height
H – Width, Depth
P – Depth, Height
Primary auxiliary view

- Inclined plane
- Line of sight
- Edge view of inclined plane
- TRUE SHAPE AND SIZE
- AUXILIARY VIEW
- Inclined plane
DEPTH AUXILIARY VIEWS

- A projection plane is perpendicular to the frontal view, and oblique to the top (or side) view. The auxiliary view is based on the frontal view.

- Depth in Auxiliary View = Depth in Top (Side) View
HEIGHT AUXILIARY VIEWS

• A projection plane is perpendicular to the top view, and oblique to the frontal (side) view. The auxiliary view is based on the top view.

• Height in Auxiliary View = Height in Frontal (Side) View
WIDTH AUXILIARY VIEWS

- A projection plane is perpendicular to the side view, and oblique to the frontal (or top) view. The auxiliary view is based on the side view.

- Width in Auxiliary View = Width in Frontal (Top) View
The features in auxiliary planes are seen deformed in the principal views.
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How to represent a full auxiliary view?
Folding-Line Method

Step 1
How to represent a full auxiliary view?

Step 2
How to represent a full auxiliary view?
How to represent a full auxiliary view?
DIHEDRAL ANGLES

Definition: An angle between two intersection planes.

Figure (a) shows a dihedral angle between surface A and B. To find the angle for the case in Figure (b), an auxiliary view is used.
A practical problem

Find the angle of the V-cut

Step 1

Step 2

Step 3
SOLUTION: TRUE SIZE OF AN OBLIQUE SURFACE
Another practical problem

Find the true shape of the section (triangle)
1. Select fold line
2. Draw perp. To F/L
1. Select fold line
2. Draw perp. To F/L
3. Transfer the dist. From the previous F/L
4. Check the visibility
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4. Check the visibility
Auxiliary Views:

To draw

TL of line, point view of line, Edge view of the plane and true size of plane.

To View TL: Draw Aux View parallel to any view

To view point view: Draw Aux View perp. To TL

To view Edge View: Draw Aux View perp. To TL of any edge/line

To view full surface: Draw Aux View Parallel to Edge view
Content of the lecture

1. Point – location, particular positions (on the principal planes)
2. Multiple points – lines
3. Location of a line – the basic views
4. Particular positions of a line – horizontal, frontal or profile
5. True length of a line – selected auxiliary views
6. Bearing of a line (in the top view, N(S) nn E(W))
7. Slope of a line (from the top view, draw a TL in aux view – elevation view)
8. Point view of a line – second aux. View
9. Relative position of a point vs. a line (location of a point vs. a line)
Content of the lecture

10. Relative position of two lines (\(//\), X or skew)
11. Parallel lines; rule of parallel lines (exceptions)
12. Location of a line through a point parallel to another line (construction)
13. True distance between two parallel lines
14. Intersecting lines – identification through inspection
15. Perpendicular lines – rule of perpendicular lines
16. Distance from a point to a line
17. Location of a perpendicular line at a given point on a line
1. Point - location

• How to represent single point on space

• Three views H, F, and P

• Similar to objects, look for distance of points from the folding line in the adjacent views
2. Multiple points - lines

- How to represent multiple points on space
- Three views H, F, and P
- Locating multiple points become important in describing a line
2. Multiple points - lines

- To describe object, relative positions of 2 points are needed.
- Point 2 is 32mm to the right of and 12mm below and 16mm behind point 1.
- The points are placed at specific distance – connected to get line.

![Diagram](image)
3. Location of a line
3. Location of a line
3. Location of a line
4. Particular positions of a line

- Inclined line appears as TL on the plane to which it is parallel
- They are termed as Frontal, Horizontal and Profile
- TL view is always inclined while the other views are foreshortened
- TL view gives more info like TA of the line to the plane of projection
- In frontal line, $\angle H$ and $\angle P$ can be found as the line is TL and planes are in EV
4. Particular positions of a line

(a) Frontal Line 1-2
(b) Horizontal Line 1-3
(c) Profile Line 2-3
5. True length of a **oblique** line

- Oblique line does not appear TL in any principal views
- So aux view is needed. Here depth aux view wrt front view is created to find the TL of the line 1-2
- $\angle F$ can also be found as the plane of projection (the wall) all points are at distance D in the top view
5. True length of a line
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5’. True length of a line
6. Bearing of a line

- Position of line in space is also described by bearing and slope of the line.

- If earth is considered as flat, then a map is a top view.

- Thus the bearing of a line is measured with respect to North or south in the top view of the line.

- Generally upward is N, and generally N and S are used together with E and W to keep the $\angle$ less than 90°.
Bearing of a line is the direction an oriented line is doing with an established direction NS. Bearing of line AB is N38E.
7. Slope of a line

• If earth is considered as flat, then a map is a top view, Horizontal plane is the most important plane

• Angle between a line (eg. Road) and horizontal plane is the slope (important to describe)

• To measure slope of 1-2, a view must be got where the line is in TL and horizontal plane in EV

• Horizontal plane is in EV in the front view and is // to HF
7. Slope of a line

Slope of the line AB is -24° since the line descends from A to B (the distance from the point of the line to the horizontal plane direction increases).
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8. Point view of a line

- If a direction of sight is // to the TL view of the line, the line will appear as a point.
- If the line is inclined, one auxiliary view is required.
- If the line is oblique, two auxiliary views are required.
- It is important to find the shortest distance between a line and a point.
8. Point view of a line

Point view of the line AB

First auxiliary view

Second auxiliary view

A1
A2

aA1=bA2

X
Y
Z

aA1
bA1

aH
bH

TL

H
F

aF
bF

aP
bP
9. Relative position of point vs. line

1. Point C - on the line AB
2. Point D - not on the line AB
9. Relative position of point vs. line

1. Point C - on the line AB
2. Point D - not on the line AB
10. Relative position of two lines

- Skew lines – non intersecting, non-parallel and not coincident
- Intersecting lines (one common point)
- Parallel lines (no common point)
- Coincident lines (overlapping – all points are common)
10a. Skew Lines
10a. Skew Lines
10a. Skew Lines

• Since lines don’t intersect, they must go one over another. This can help to find out which one goes over the other.

• If you plot 5,6 (arbitrarily one point to one line) on TV and project it to FV – we can see which line is passing above the other line.
10b. Parallel Lines

- Parallel lines do not have any common point between them.
- Parallel lines are seen as parallel in adjacent views, exception to this when the lines are perpendicular to the FL, the lines may or may not be parallel.
10b. Parallel Lines

- To find out if the lines are parallel, even if the lines are perpendicular to the FL, it is best to draw the 3rd view.

- If it is required to get the lines parallel, then use one view, draw the lines parallel and complete the 3rd view.
10b. Parallel Lines
10c. Intersecting Lines

- Intersecting lines have one common point between them.
- The projection of the points must be aligned in adjacent views.
- If they are, then the lines are intersecting.
- If not, they are skewed.
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- If not, they are skewed.
10c. Coincident lines
10c. Coincident lines
11. Location of a line

Locate a line // to a given line passing through a point
11. Location of a line

Locate a line // to a given line passing through a point
12. True distance between 2 // lines
12. True distance between 2 parallel lines
12. True distance between 2 // lines

Distance between the two points gives the true distance between parallel lines
13. Perpendicular lines

- A 90° angle appears in true size in any view showing one leg in TL provided the other leg does not appear as point view.

- Two intersecting lines are perpendicular if the TL projection is making 90° with the other line.
13. Perpendicular lines