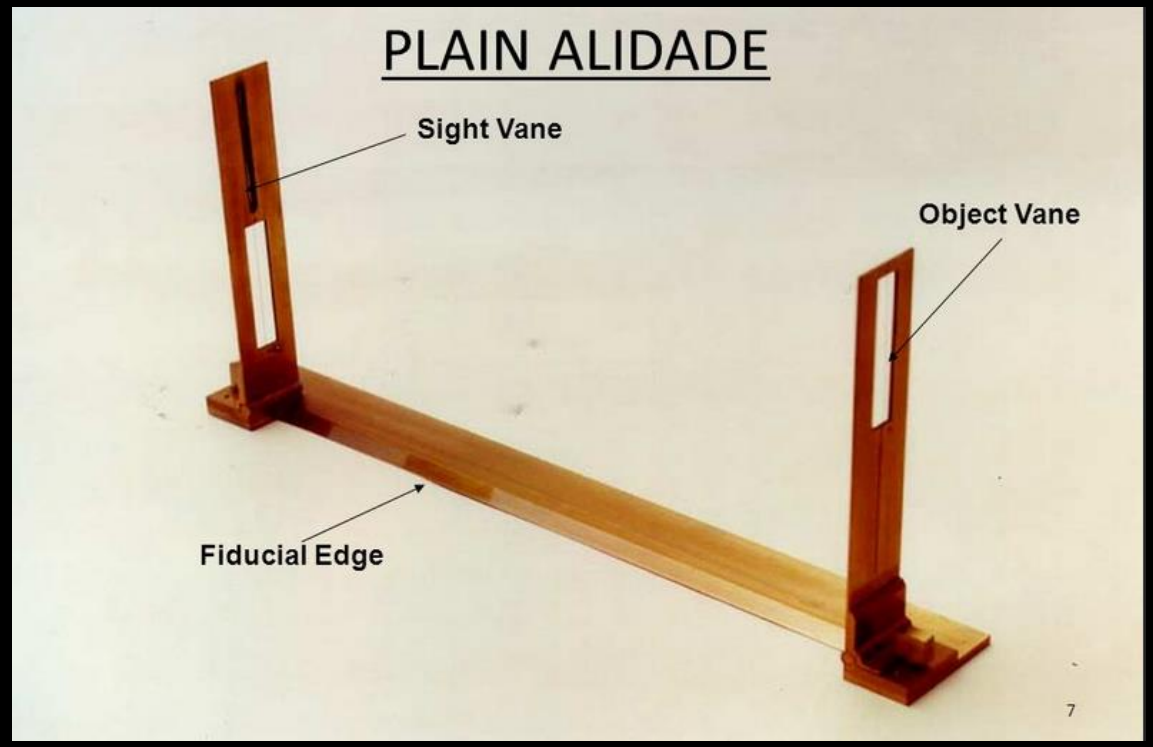
Plane Table Surveying

Plane Table Surveying

- Plotting of the plan and field observations can be done simultaneously
- Geometrical conditions of site are manuscript in the map sheet using plane table and alidade after that topographic details are arranged on the map.
- Best fitted for small-scale surveying
- Surveying industrial areas where compass survey fails to perform
- Used to fill in details between stations fixed by triangulation method or theodolite traversing method.

Instruments used

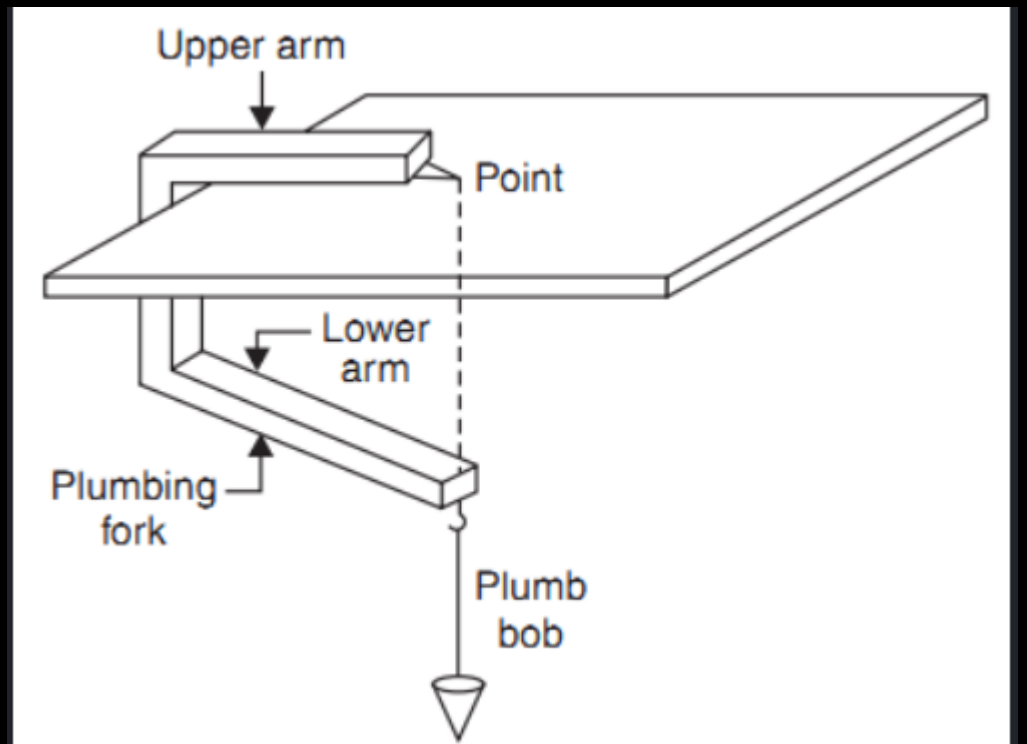
- **Drawing Board**
  - The board may be mounted on a tripod with a leveling head or a ball-and-socket arrangement in such a fashion that it can be leveled and revolved about a vertical axis and may be clamped in any position.
- **Alidade**
  - The alidade is a ruler with a sight line attached and is used on the plane table for bisecting the object, drawing rays, direction lines, etc.



- **One of the sight vanes is provided with a narrow rectangular slit. While other is provided with a central vertical hair or wire.**

Instruments used

- Trough compass
- Plumbing fork or U-frame
- Spirit level
- Plumb bob
- Ranging rods
- Drawing sheet



Instruments used : Spirit level

- A spirit level is required to ensure levelling the table surface.

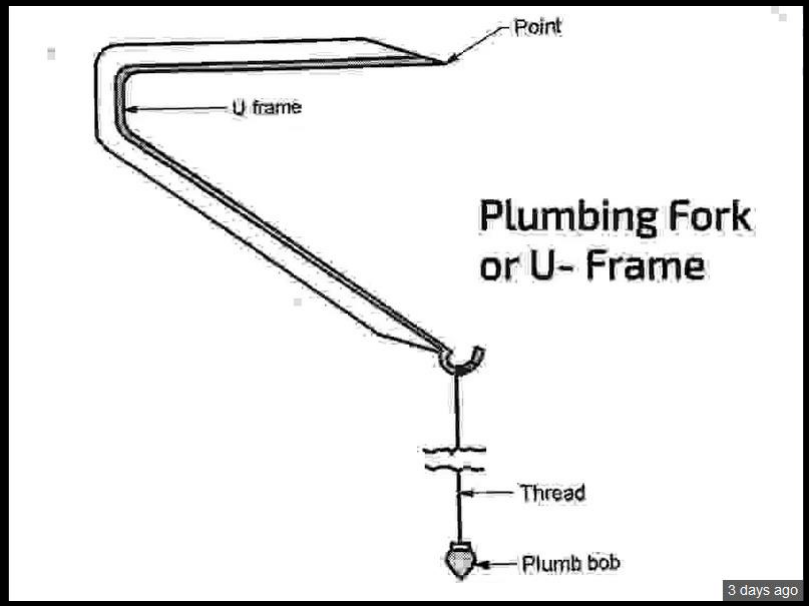
- The spirit level can be place in two perpendicular directions and levelled.

Instruments used : Magnetic needle

- A magnetic needle in a rectangular box is generally used.
- By turning the box placed on the table, the needle is made to read zero.
- A line drawn along the edges of the box gives the magnetic meridian

Instruments used : Magnetic needle

- A folded frame with a hook and a plumb bob at the lower limb makes up the plumbing fork.
- The upper frame is placed on the sheet with its pointed end at a point marked as station.
- The tripod legs are adjusted to bring the plumb bob over the station mark.



Procedure

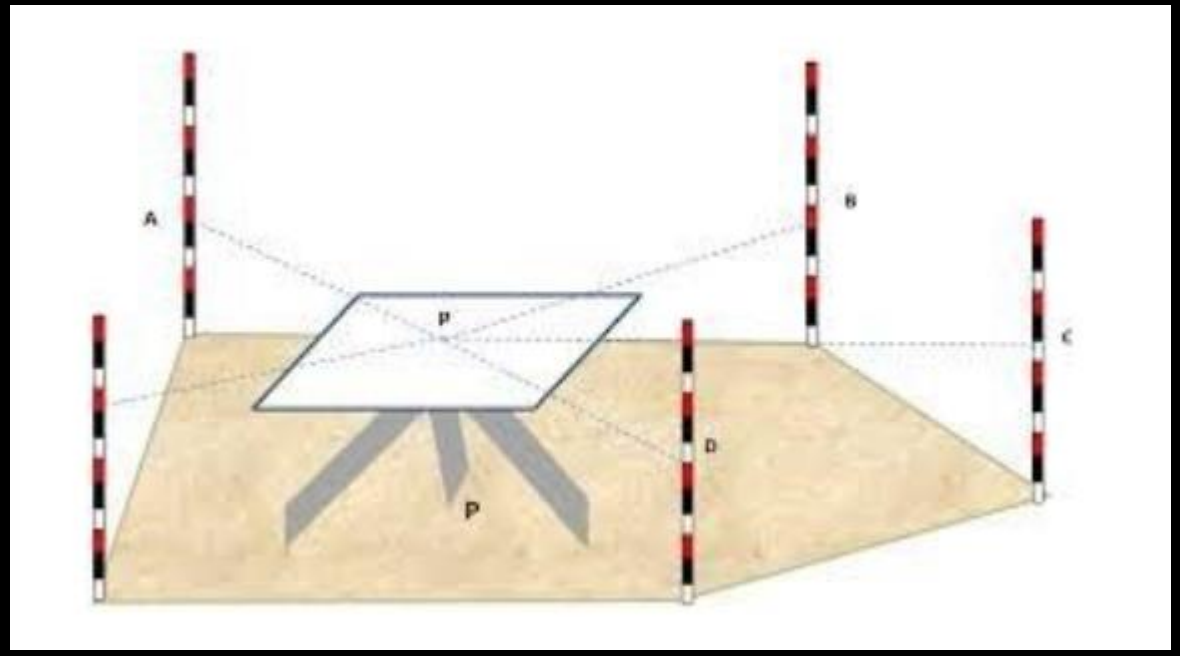
- **Fixing of Plane Table**
- **Leveling of Plane Table → spirit level**
- **Centering of Plane Table →** plumbing fork
- **Orientation of Plane Table →** compass or back sighting

Methods of Plane Table Surveying

- **Radiation**

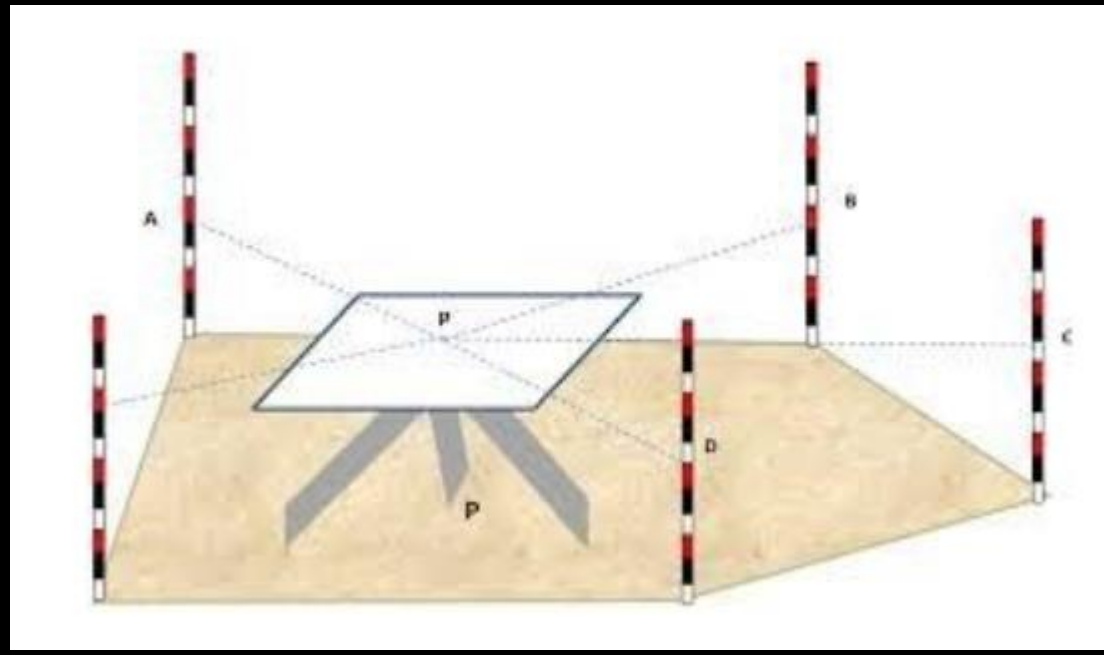
This method is only effective if the whole surveying is to be done from one single station i.e. the table will be in such a position from where all the other points of the field are easily visible.

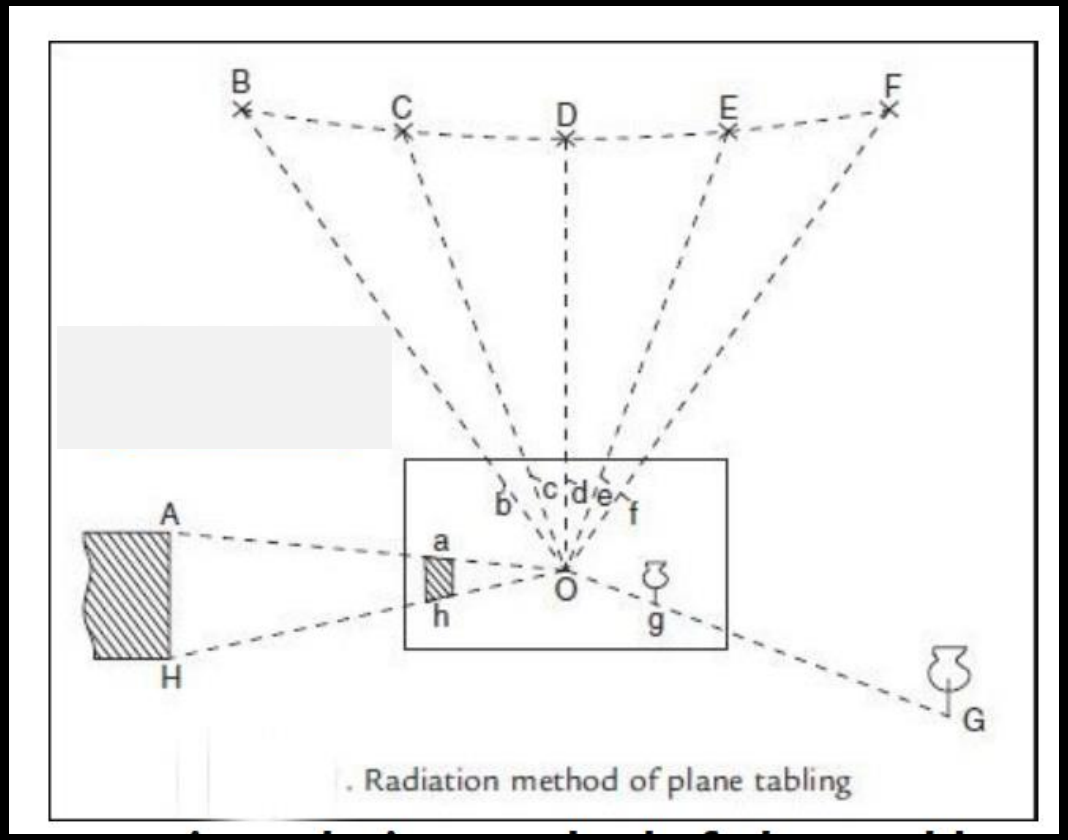
i. A point P is to be selected in such a fashion that all the other points (A B C D E) are seen easily from P
ii. Centering, leveling, and orientation must be done prior to surveying
iii. At first, by putting the alidade on point P a line of sight for station A is to be drawn.



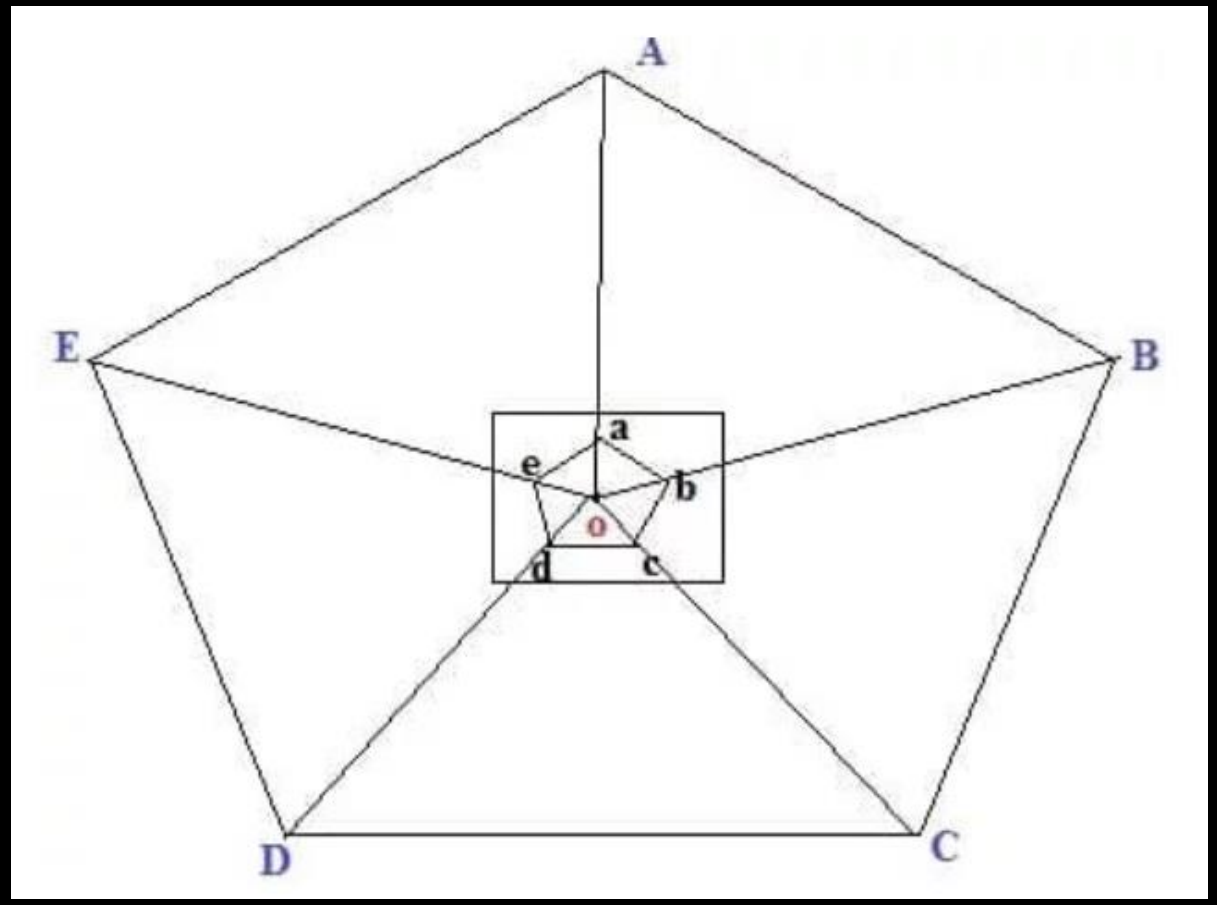
Methods of Plane Table Surveying

iv. After measuring the distance of PA on field, the measurement needs to be put on paper to a suitable scale.
v. Similarly, points b, c, d, and e are obtained on paper by drawing lines of sight for stations B, C and D and measuring the distances PB, PC, PD and PE on ground respectively.
vi. Points a, b, c, d, and e are joined on paper, as shown in the figure.





. Radiation method of plane tabling



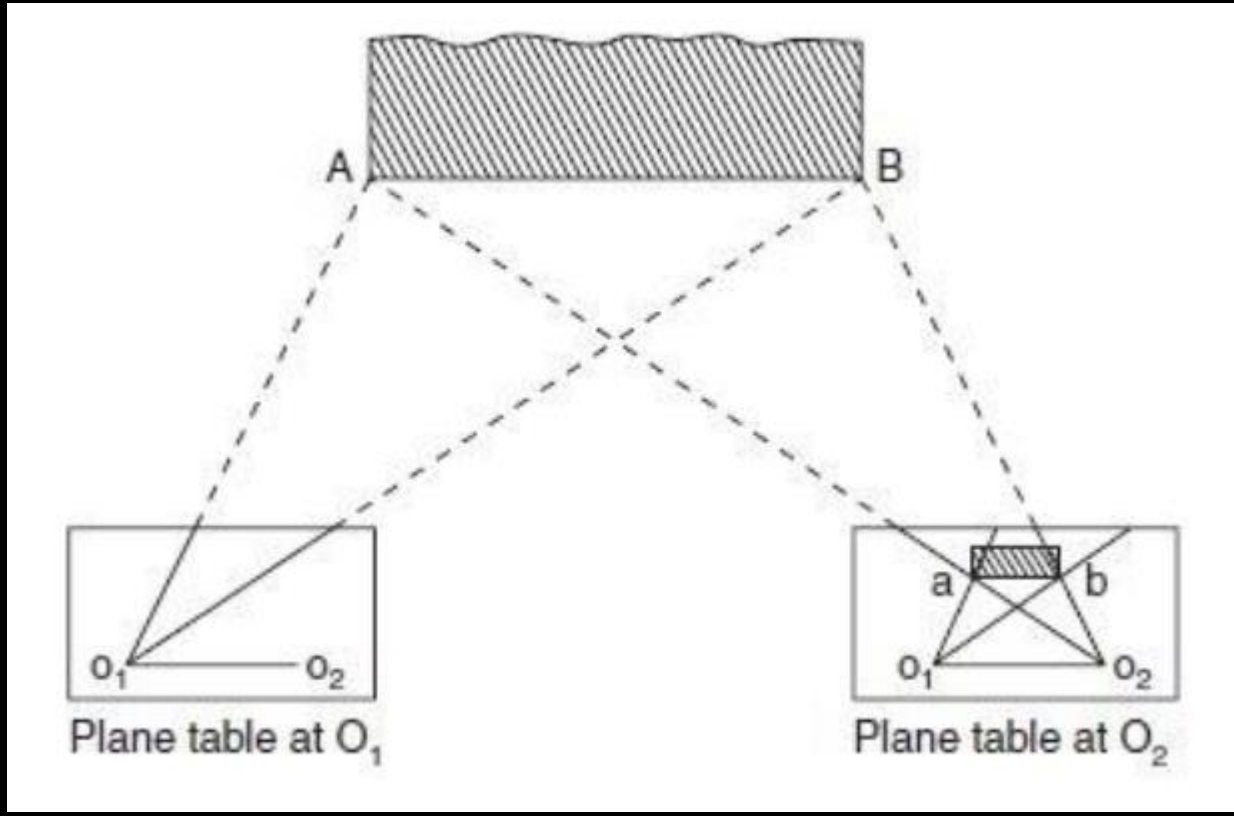
Methods of PT : Intersection

In case of a mountainous terrain or rough surface where distances cannot be taken physically, it is best to use intersection method.

i. Two stations O1 and O2 are selected so that the points to be located on paper are easily seen from them.

ii. The baseline (o1o2) is plotted on the paper.

The table can be centered and leveled at station O1 and then after orienting at station O2, the distance O1 O2 can be accurately measured and put up to some scale on the paper. The line o1o2 can be drawn to some scale on the paper and then the board can be adjusted from station O1 by back sighting at station O2.

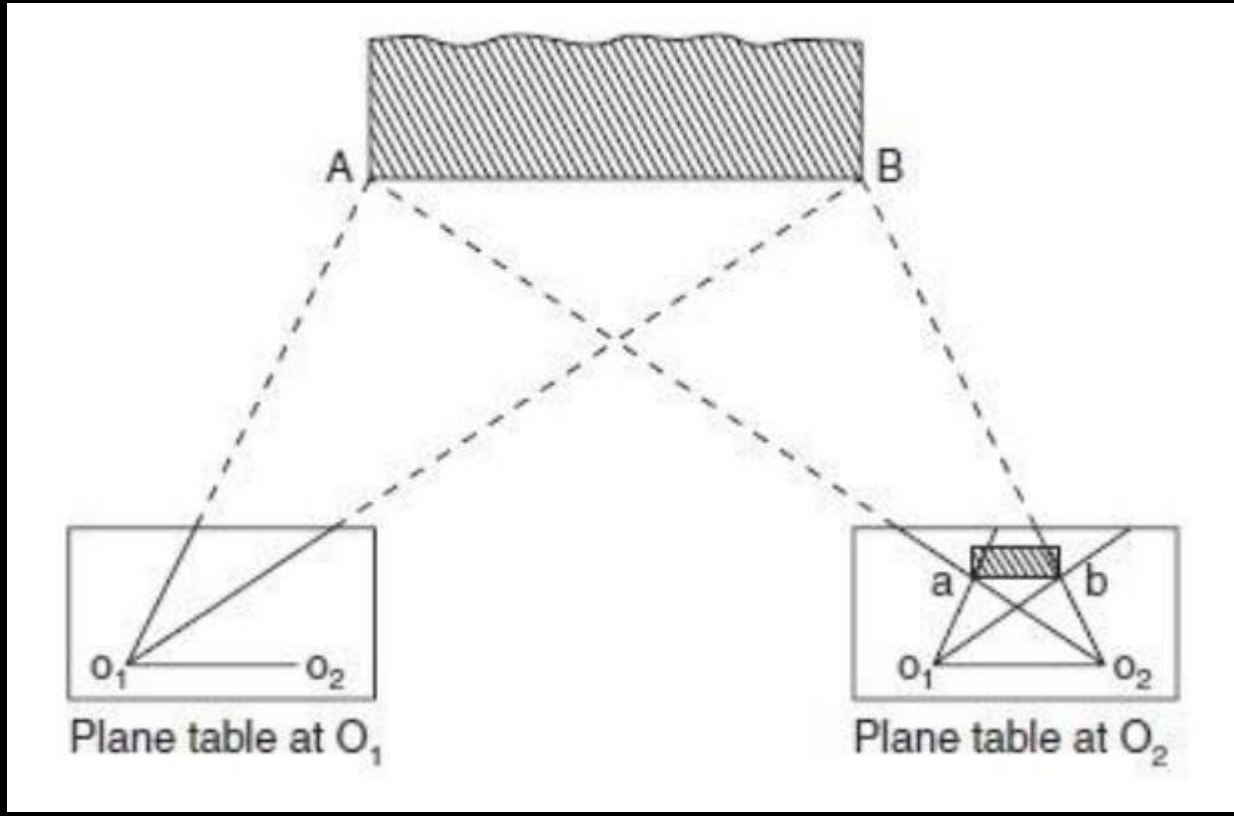


Methods of PT : Intersection

iv. From station O1, rays for stations A, B are drawn

v. Now moving the table to the new station and orienting it again the rays of stations A, B are drawn etc.,

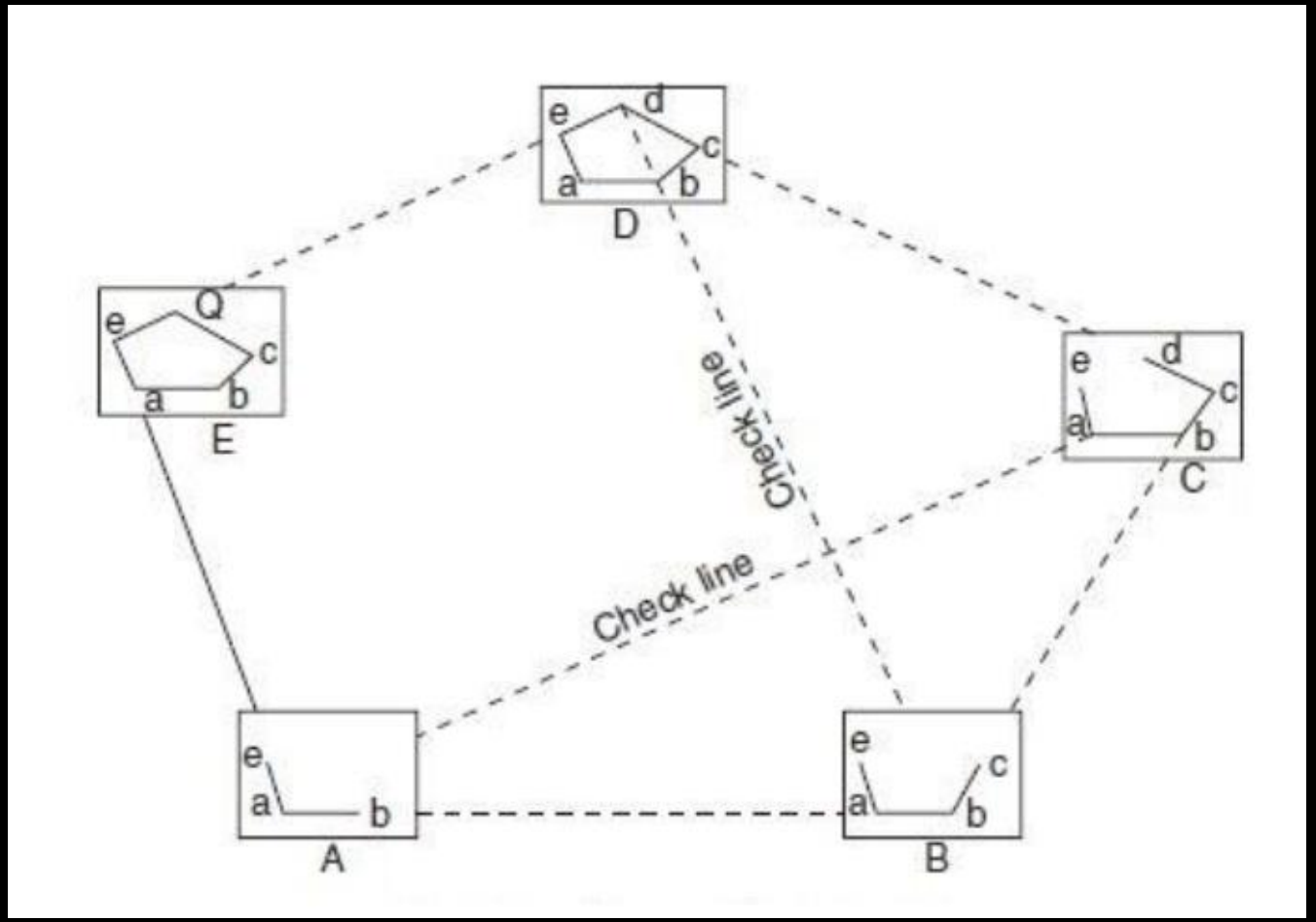
vi. The intersection of rays from stations O1 and O2 will give points a, b etc. on paper, as shown in the figure.



Methods of PT : Traversing Method

- It is used for running survey lines between stations, which have been previously fixed by other methods of survey, to locate the topographic details.

i. The plane table is fixed at a location (say A)
ii. From that point, a sight is taken toward B and the distance AB is measured.
iii. The plane table is shifted to station B and sighted toward A (this is called back sighting). Distance BA was measured.

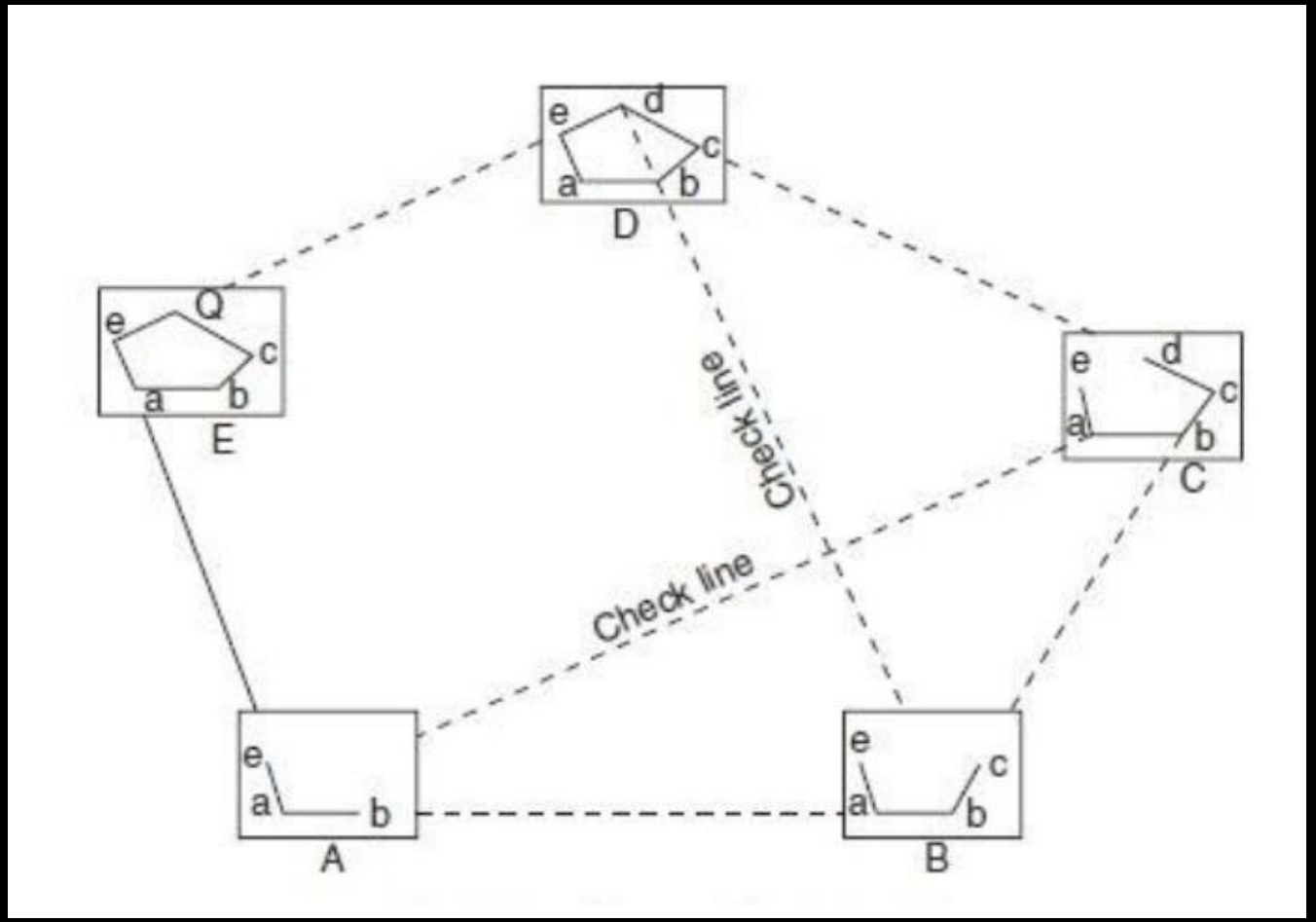


Methods of PT : Traversing Method

- It is used for running survey lines between stations, which have been previously fixed by other methods of survey, to locate the topographic details.

iv. The average distance between AB and BA are plotted to suitable scale on the drawing paper.

v. Then the point C is sighted from B and the distance was measured. This process is repeated for all the stations.



Resection Method

- Resection is a method of orienting the table.
- The objective is to plot the station occupied by the table rather than plotting other points.
- After resection, the station occupied by the table is obtained on the sheet in correct orientation.
- The two-point and three-point problems are resection methods.

Three point problem

- Given three visible stations and their plotted positions, to plot the station occupied by the table with the table correctly oriented.
- 1.Mechanical method (Tracing paper method)
- 2.Graphical method (Bessel's method)
- 3.Trial and error method

Mechanical method

1.The table is placed at P and levelled. A tracing paper is fixed on the map and a point p is marked on it.

2. With the alidade centred on P, the points A, B, C are bisected and the rays are drawn. The rays will not pass through the points a,b,c.

3. Now the tracing paper is removed and moved over the map such a way that , the three rays at a time pass through the positions a, b, c.

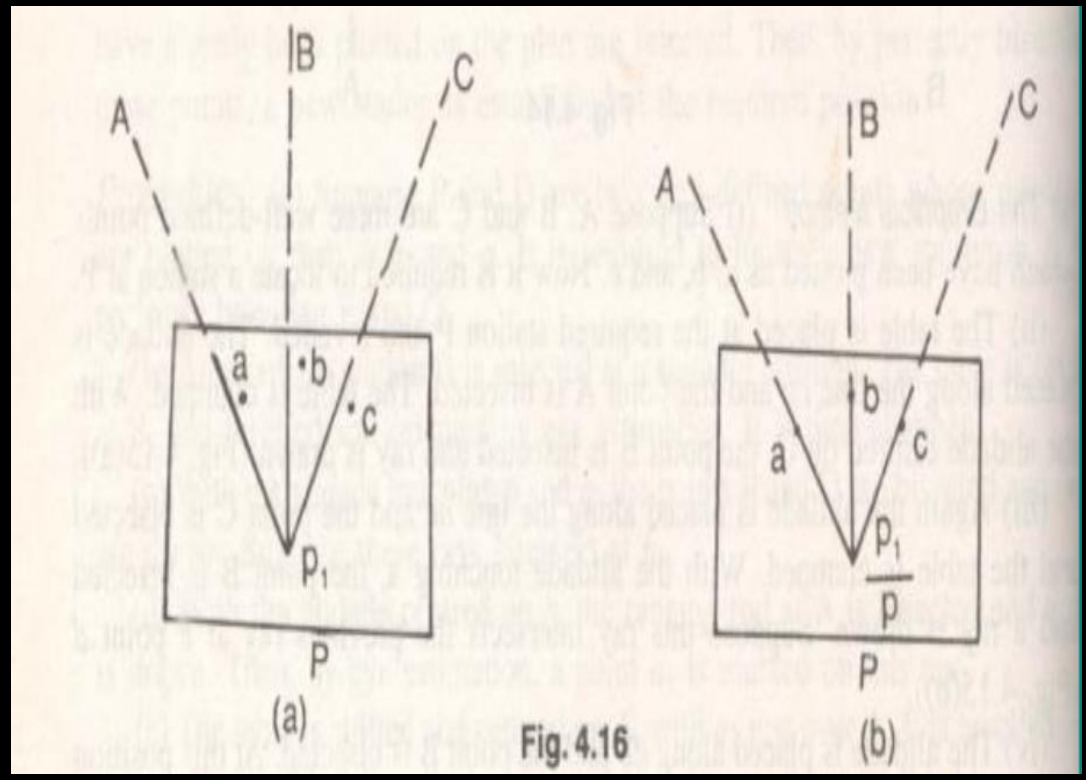


Fig. 4.16

Mechanical method

4. The point p is picked with a pin to give a impression pon the map. pis the required point on the map. The tracing paper is removed.

5. Alidade is centred on pand the rays are drawn towards A, B, C. These rays must pass through the points a,b,c.

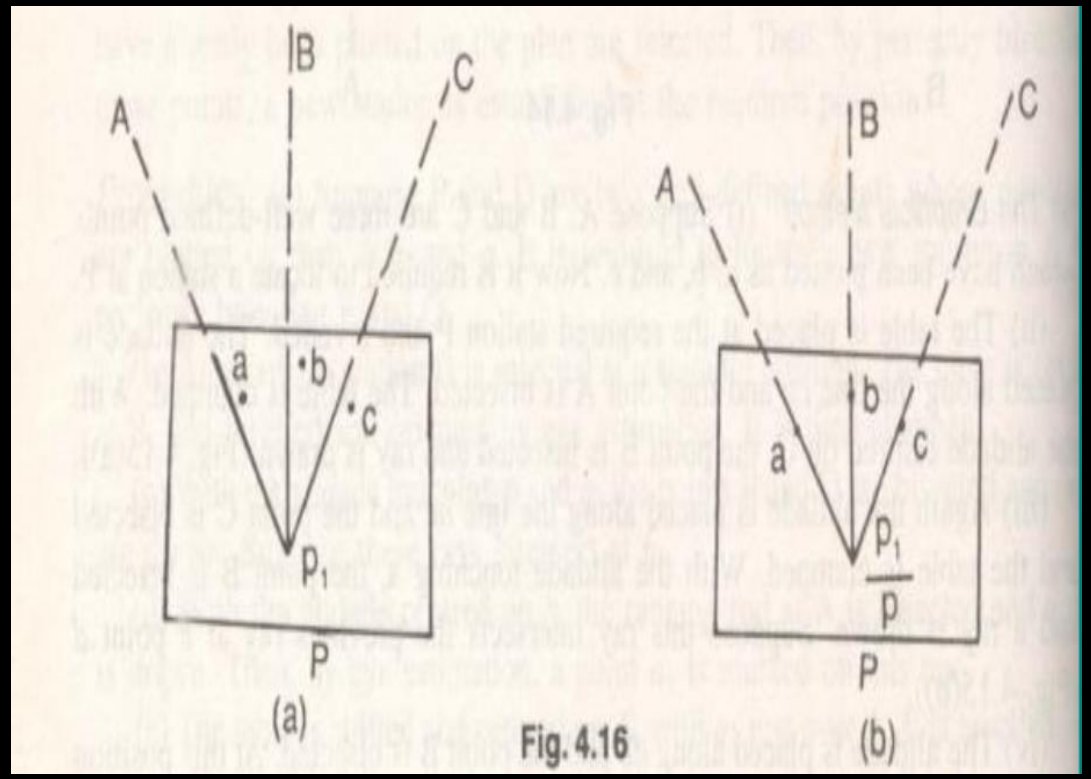


Fig. 4.16

General Instructions while Plane Table Surveying:

- The points A, B, C etc. on the ground should be denoted by the corresponding small letters a, b, c, etc. when plotted on the sheet.
- The table should be turned only when it is to be oriented. After performing the orientation, it must be kept clamped in position.
- The table should be kept clamped in position while the objects are sighted. Only the alidade should be moved on the table to bisect the objects.
- While the sights are being taken, the drawing edge of the alidade must be set touching the plotted station-point on the sheet and not the other edge.
- The lines should be drawn as fine as possible and with a good quality hard pencil.

Errors in Plane Tabling Surveying

- Instrumental errors.
- Errors of manipulation and sighting.
- Errors of Plotting.

Instrumental Errors:

(i) The surface of the board not being a perfect plane.

(ii) The fiducially edge of the alidade not being a straight line.

(iii) The sights of the alidade not being perpendicular to its base.

(iv) The fittings of table and tripod being loose.

(v) The defective trough compass

Errors of Manipulation and Sighting

(i) The board not being horizontal.

(ii) The table not being accurately centered.

(iii) The table not being correctly oriented.

(iv) The table not being properly clamped.

(v) The objects not being correctly sighted.

(vi) The alidade not being correctly centered on the station-pointing the paper.

(vii) The rays not being accurately drawn through the station point.

Errors of Plotting

(i) By using a good quality paper and stretching it properly on the board.

(ii) By constant care in drawing and in the use of scales.