# CE-103
# Surveying
# Lecture-1
# Chain Survey

# Chain Survey

The chain survey is the simplest method of surveying. In the chain survey, only measurements are taken in the field. Here only linear measurements are made i.e. no angular measurements are made. This is most suitably adapted to small plane areas with very few details. If carefully done, it gives quite accurate results.

**Suitability of Chain Survey**

Chain survey is suitable in the following cases:

1. The area to be surveyed is comparatively small
2. The ground is fairly level
3. The area is open and
4. Details to be filled up are simple and less.

# Procedure in Chain Survey

**1.Reconnaissance:** The preliminary inspection of the area to be surveyed is called reconnaissance. The surveyor inspects the area to be surveyed, surveyor prepares index sketch or key plan.

**2.Marking Station:** The surveyor fixes up the required no stations at places from where maximum possible stations are possible.

3.Then he selects the way for passing the mainline, which should be horizontal and clean as possible and should pass approximately through the center of work.

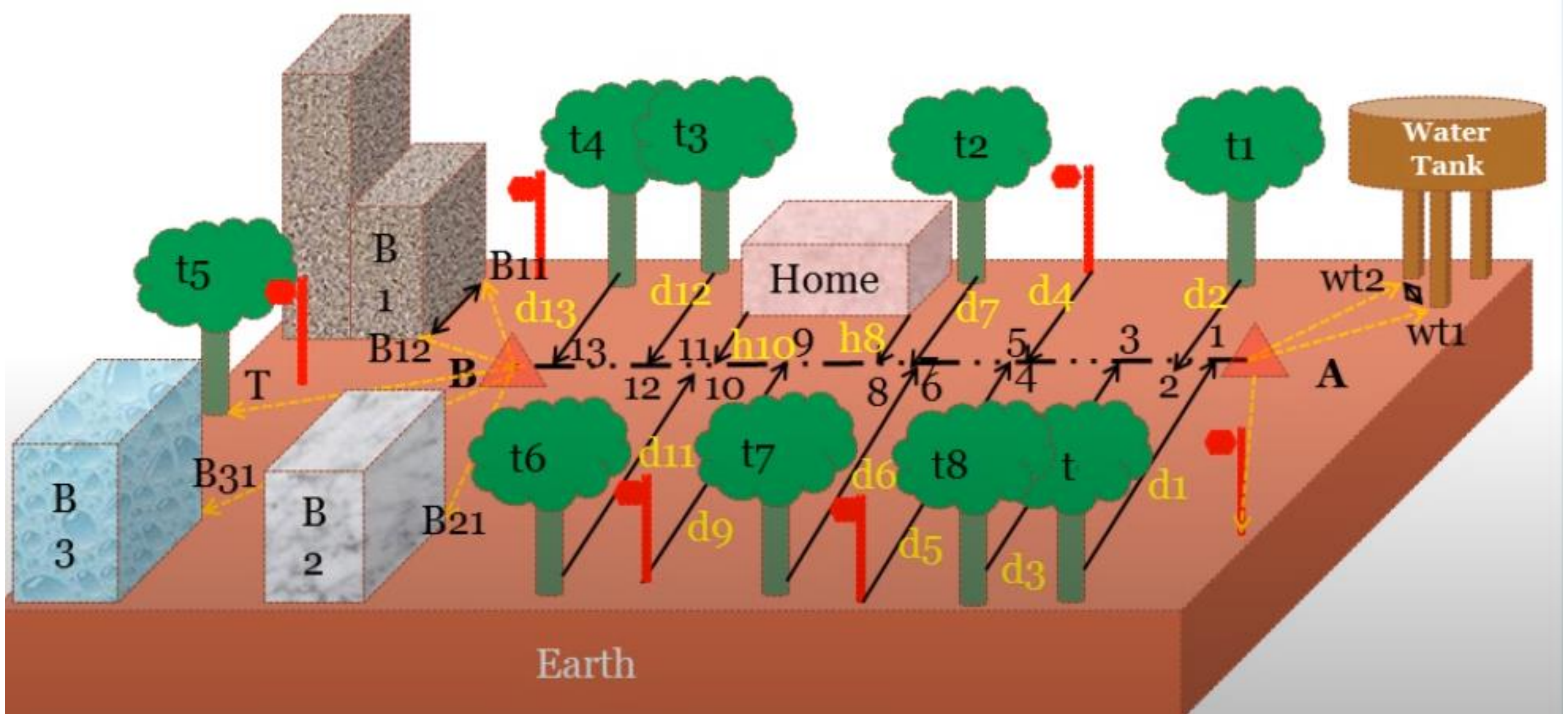
4.Then ranging roads are fixed on the stations.

5.After fixing the stations, chaining could be started.

6.Make ranging wherever necessary.

7.Measure the change and offset.

8.Enter in the field the book.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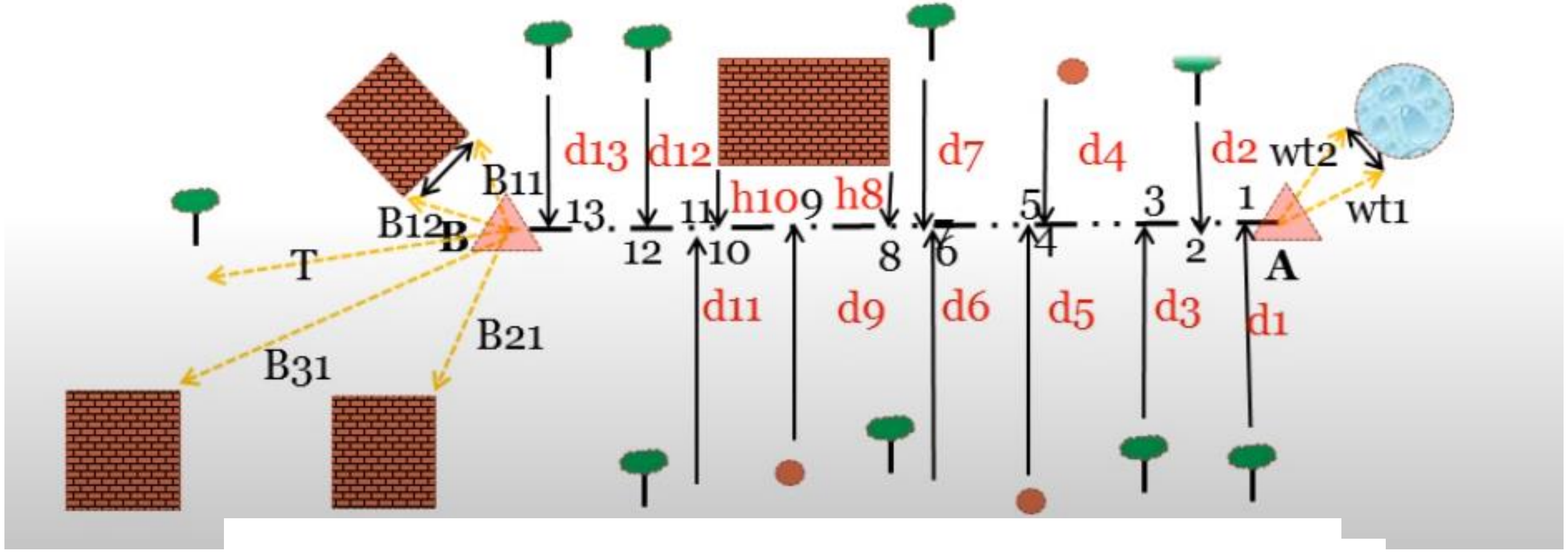
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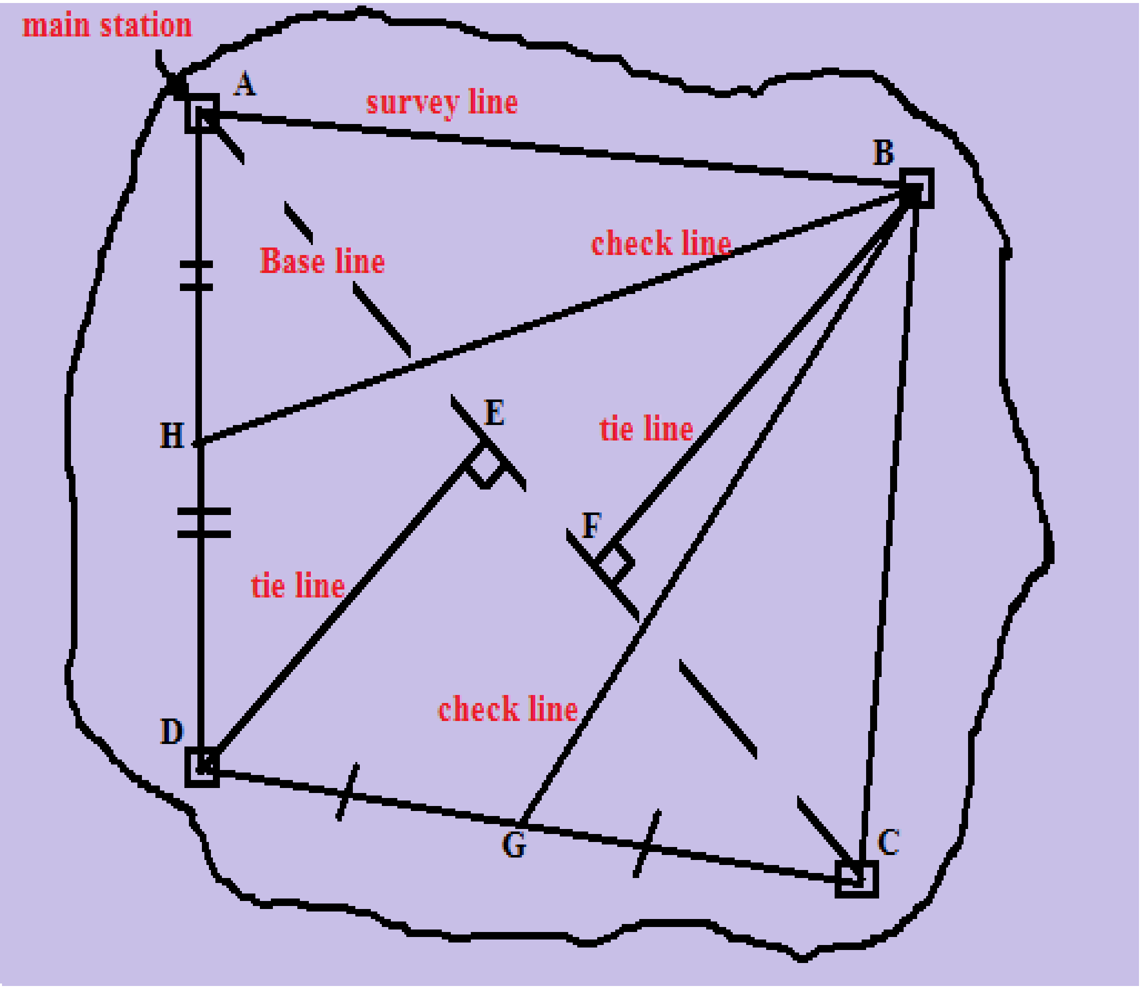
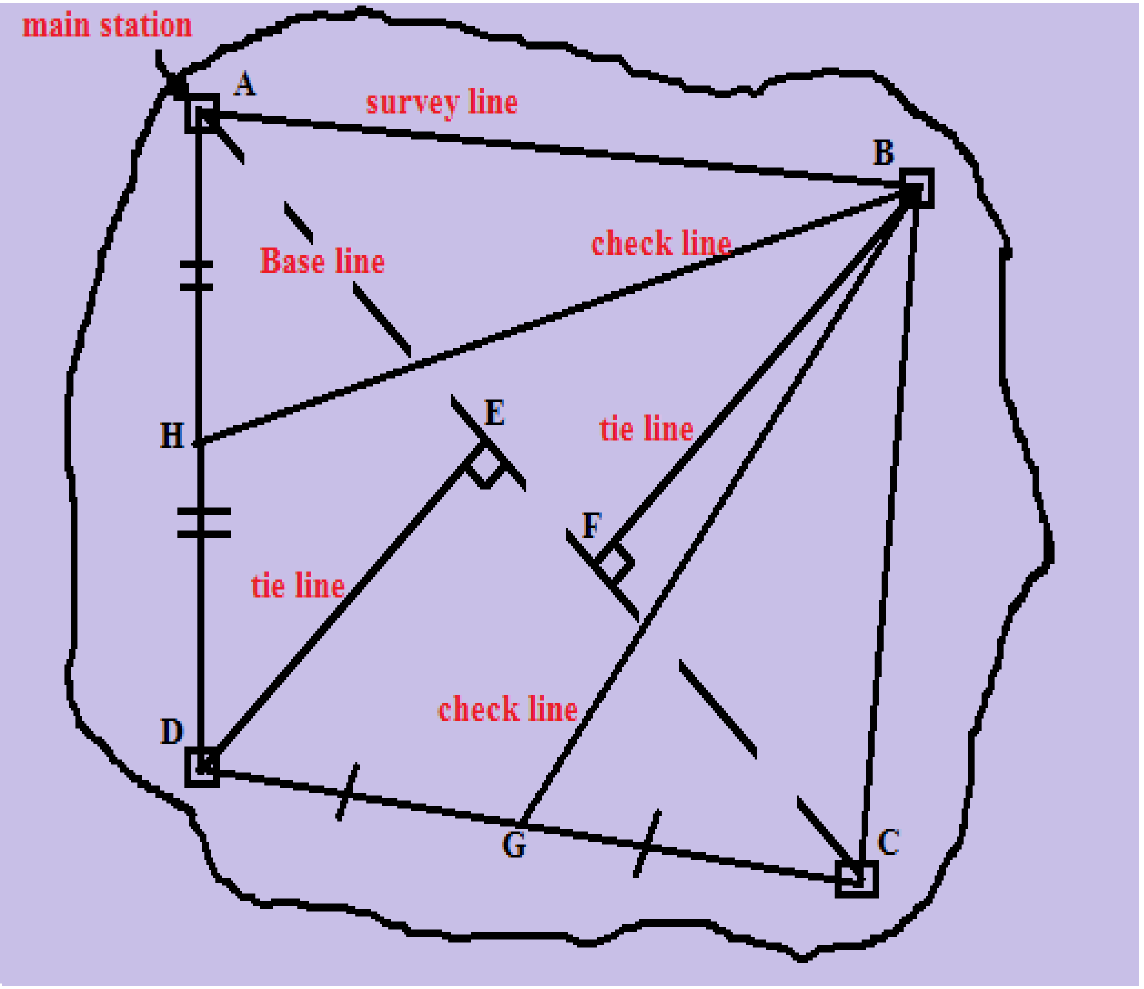


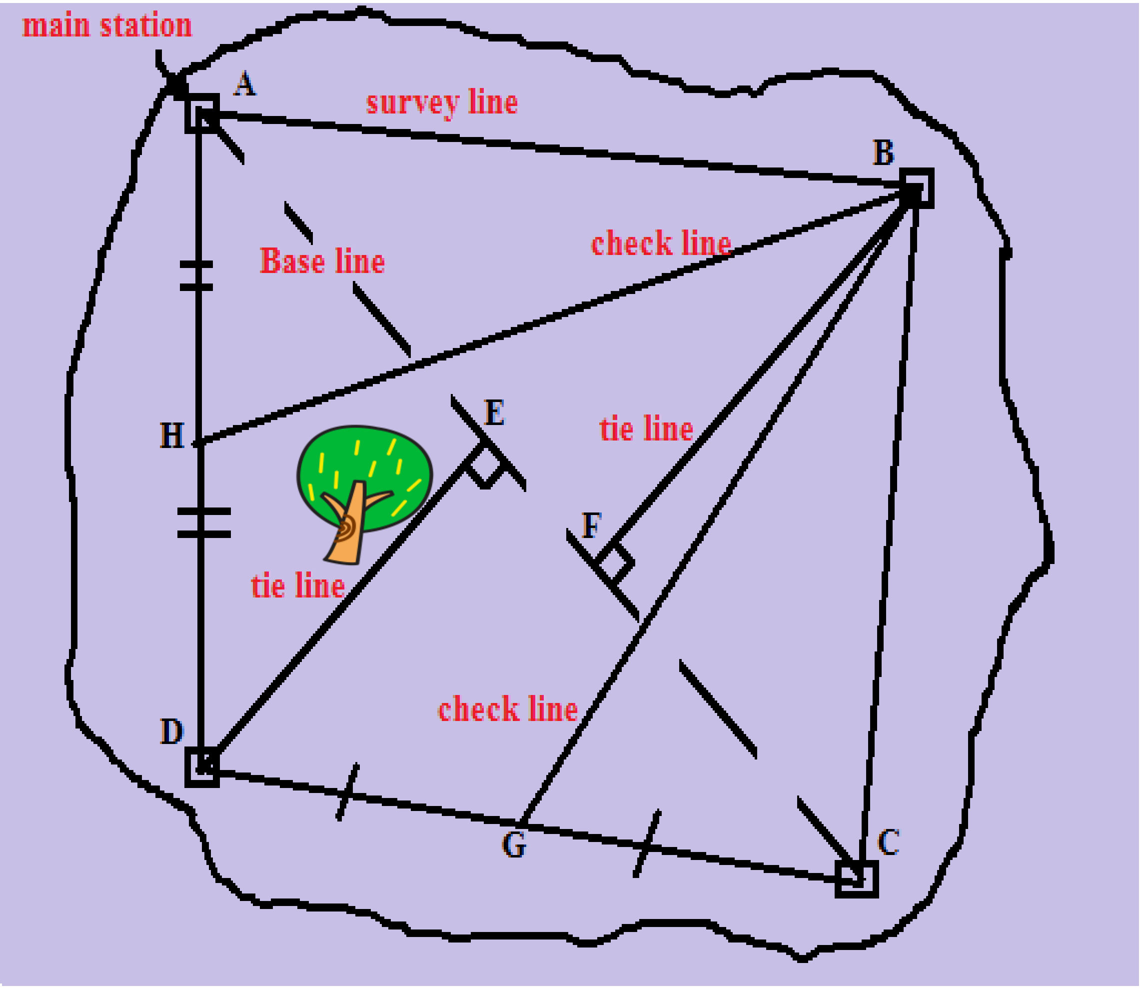

## Base Lines

It is the main and longest line, which passes approximately through the center of the field. All the other measurements to show the details of the work are taken with respect to this line.




## Check Line

A check-line also termed as a proof-line is a line joining the apex of a triangle to some fixed points on any two sides of a triangle. A check-line is measured to check the accuracy of the framework. The length of a checking line, as measured on the ground should agree with its length on the plan.




## Tie or Subsidiary Lines

A tie line joints two fixed points on the main survey lines. It helps to check the accuracy of surveying and to locate the interior details. The position of each tie line should be close to some features, such as paths, buildings, etc.

It sometimes happens that a survey line passes through some object such as a pond, a building, a river, etc. which prevents the direct measurement of that part of the line which the object intersects. The interfering object in such a case is called on obstacle

## 3 Main Types of Obstacles in Chaining of a Line

1. Chaining Free, Vision Obstructed
2. Chaining Obstructed, Vision Free
3. Chaining and Vision Both Obstructed.

# Chaining Free, Vision Obstructed

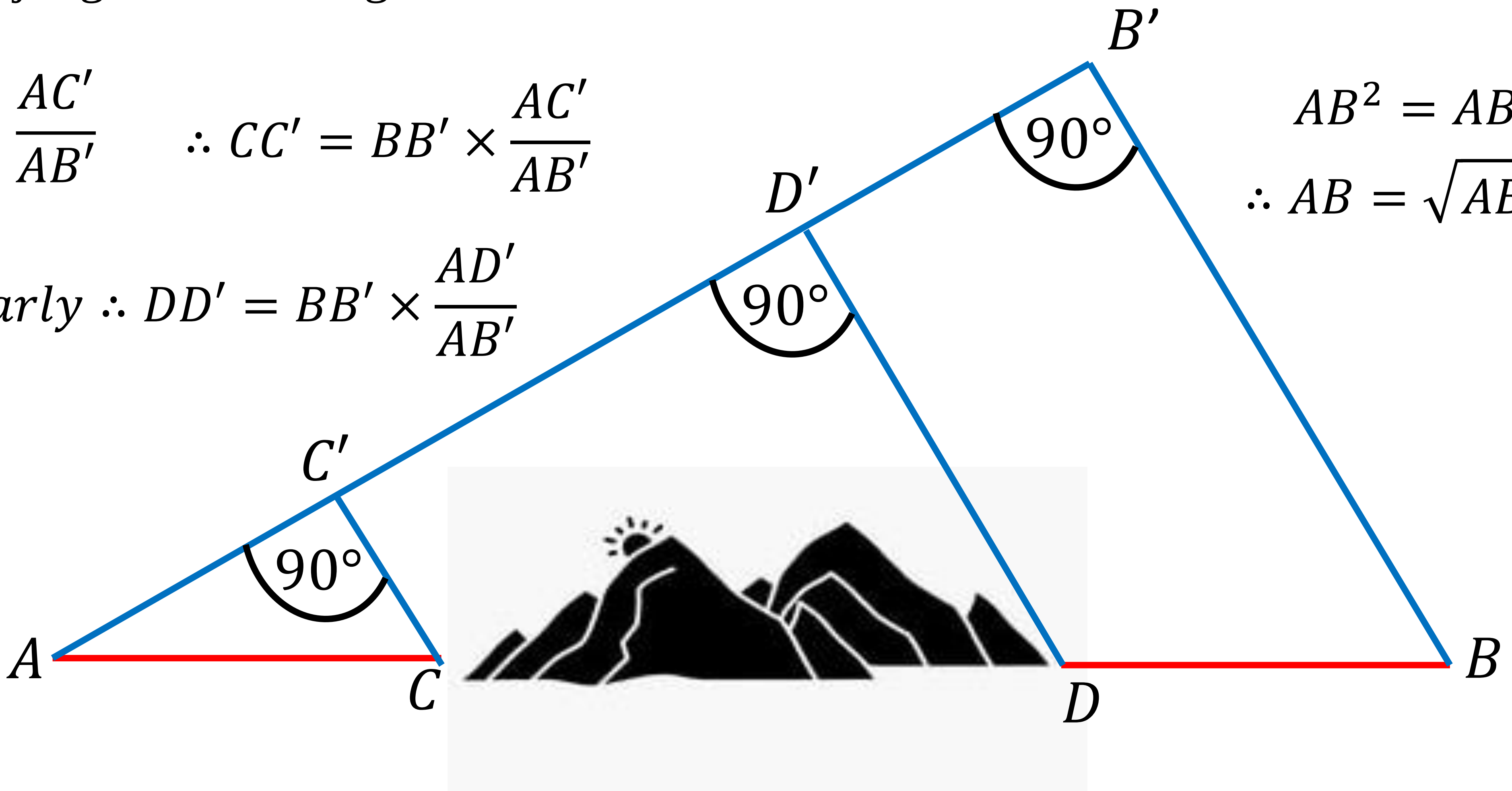
In this type of obstacles, the ends of the lines are not intervisible e.g. rising ground, hill or jungle intervening.

$$\frac{CC'}{BB'} = \frac{AC'}{AB'} \qquad \therefore CC' = BB' \times \frac{AC'}{AB'}$$

$$Similarly \therefore DD' = BB' \times \frac{AD'}{AB'}$$

$$AB^2 = AB'^2 + BB'^2$$

$$\therefore AB = \sqrt{AB'^2 + BB'^2}$$



# Chaining Obstructed, Vision Free

The typical obstacle of pond the width of which in the direction of measurement exceeds the length of the chain or tape. The problem consists in finding the distance between convenient points on the chain line on either side of obstacle.

(a) Set out equal perpendiculars AC and BD [Fig. 3.21 (a)]. Measure CD which is equal to AB.

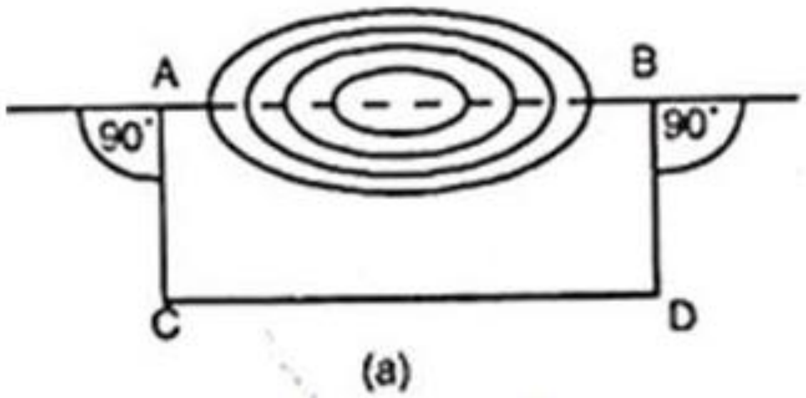



Fig 3.21(a)

# Chaining Obstructed, Vision Free

(b) Erect perpendicular AC [Fig 3.21(b)] of such a length that CB clears the obstacle and measure AC and CB.

$$BC^2 = AC^2 + AB^2 \quad \therefore AB = \sqrt{BC^2 - AC^2}$$

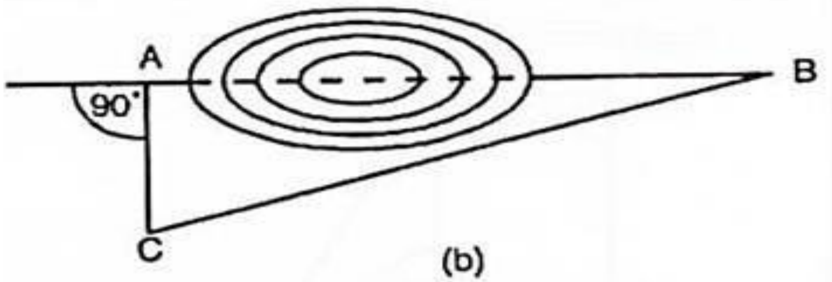


Fig. 3.21. (b)

(C) Find by optical square or a cross-staff a point C such that ∠ACB is right angle [Fig. 3.21(c)] Measure AC and BC.

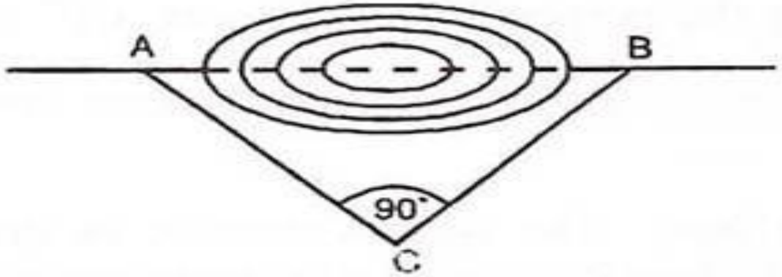


Fig 3.21 (c)

$$AB^2 = AC^2 + BC^2 \quad \therefore AB = \sqrt{AC^2 + BC^2}$$

# Chaining Obstructed, Vision Free

(d) Mark a point C so that CA and CB clear the obstacle [Fig. 3.21. (d)]. Range E in line with AC so that CE = AC. Then range D in the line with BC so that CD = BC. The triangles CAB and CED are congruent. Therefore DE = AB.

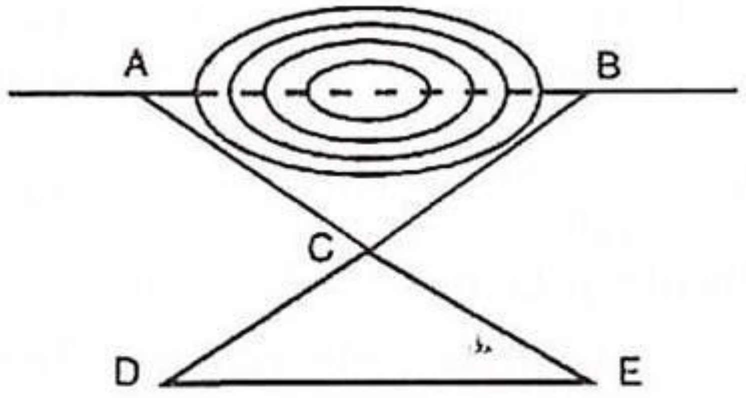


Fig 3.21 (d)

e) Fix two points A and B as before [Fig. 3.22 (e)].

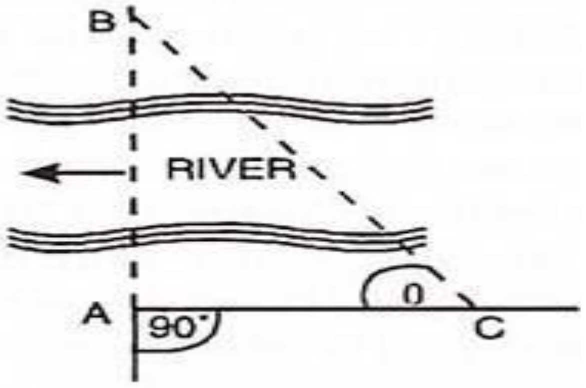


Fig. 3.22 (d)

$$tan\theta = \frac{AB}{AC}$$

$$\therefore AB = AC\ tan\theta$$

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# Chaining and Vision Both Obstructed

A building is a typical example of this class of obstacles. The problem in this case consists both in prolonging the line beyond the obstacle and finding the distance across it.

(a) Select two points A and B on the chain line [Fig. 3.23 (a)]. At A and B, erect equal perpendiculars AC and BD. Join CD and produce it past the obstacle. Select two points E and F on it. At E and F, set out perpendiculars EG and FH, each equal in length to AC. The points G and H then lie on the chain line and BG = DE.

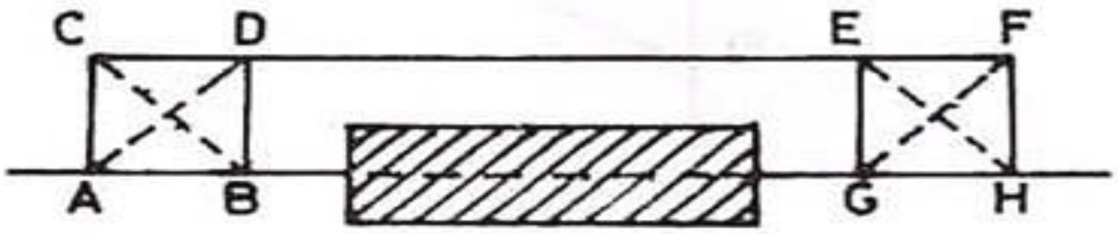



Fig. 3.23. (a)

There is an obstacle in the form of a pond on the main chain line AB. Two points C and D were taken on the opposite sides of the pond. On left of CD, a line CE was laid out 100 m in length and a second line CF, 80 m long was laid out on the right of CD such that E, D and F are in the same straight line. ED and DF were measured and found to be 60 m and 56 m respectively. Find out the obstructed length CD.

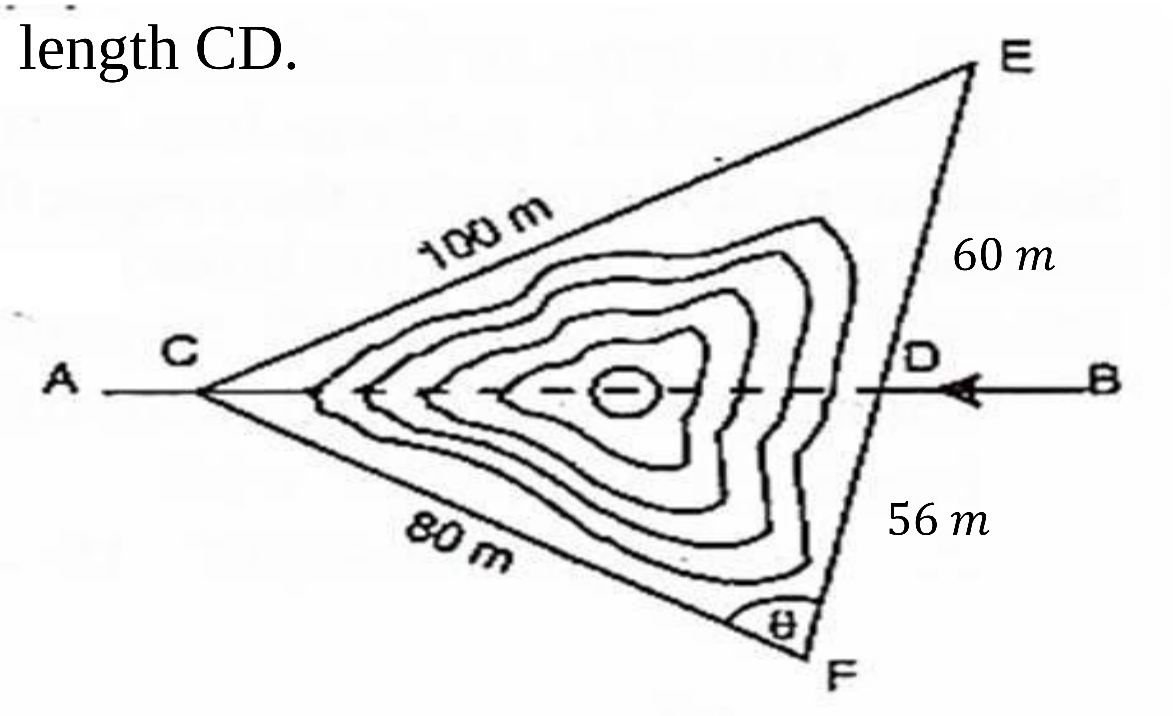
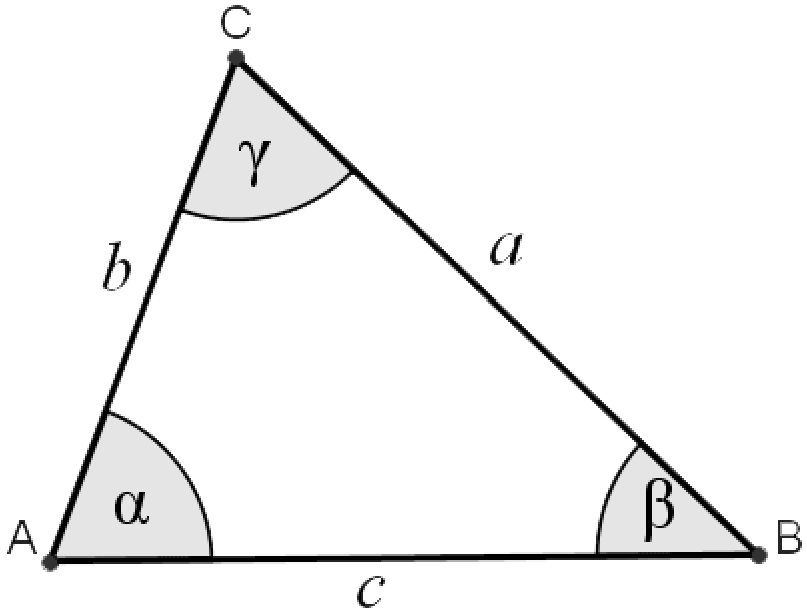


FIG. 3.24




$$Cos\alpha = \frac{b^2 + c^2 - a^2}{2bc}$$

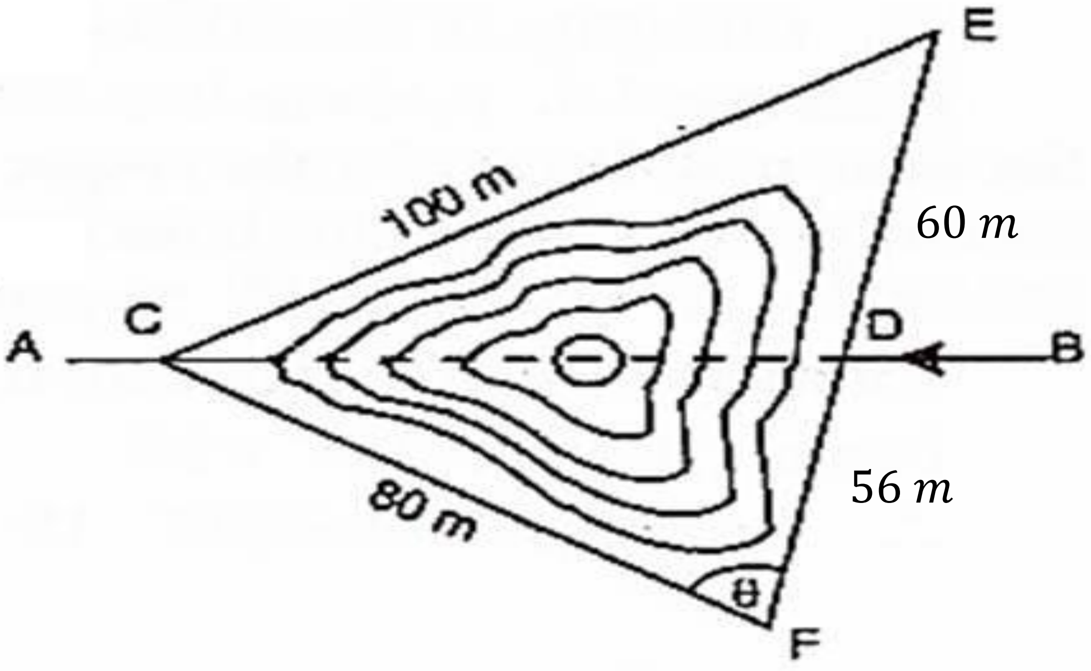



FIG. 3.24

$\Delta FCE$

$$Cos\theta = \frac{FC^2 + FE^2 - CE^2}{2.FC.FE}$$

$$Cos\theta = \frac{80^2 + 116^2 - 100^2}{2 \times 80 \times 116}$$

$\Delta FCD$

$$Cos\theta = \frac{FC^2 + FD^2 - Cd^2}{2.FC.FE}$$

$$Cos\theta = \frac{80^2 + 56^2 - CD^2}{2 \times 80 \times 56}$$

$$\frac{80^2 + 116^2 - 100^2}{2 \times 80 \times 116} = \frac{80^2 + 56^2 - CD^2}{2 \times 80 \times 56} \quad \therefore CD = 69.123\, m$$

# Thank You

**Stay Safe**
**Stay Aware**