Obstacles in chaining

Obstacles to chaining prevent chainman from measuring directly between two points and give rise to a set of problems in which distances are found by indirect measurements. Obstacles to chaining are of three kinds:

1. Obstacles to ranging.
2. Obstacles to chaining.
3. Obstacles to both chaining and ranging.

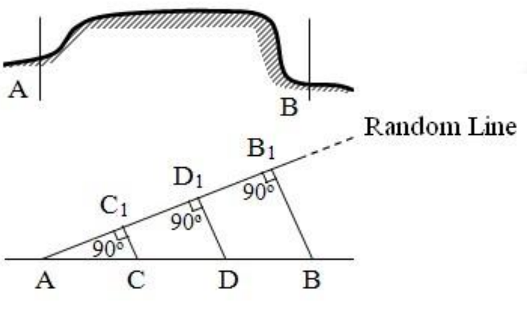
1. **<u>Obstacles to ranging but not chaining:</u>**

This type of obstacle, in which the ends are not visible, is quite common except in flat country. There may be two cases of this obstacle:

i. Both ends of line may be visible from intermediate points on the line.
ii. Both ends of the line may not be visible from intermediate points on the line.

Case (i): method of reciprocal ranging as shown in page 11 may be used.

Case (ii): in figure below, let AB is the line in which A and B are not visible from intermediate point on it. Through A, draw a random line AB_1 in any convenient direction but as nearly towards B as possible. The point B_1 should be so chosen that (i) Bi is visible from B and (ii) BB_1 is perpendicular to the random line.



Measure BB_1. Select points C_1 and D_1 on the random line and erect perpendicular C_1C and D_1D on it.

Make $CC_1 = \frac{AC_1}{AB_1} * BB_1$ and $DD1 = \frac{AD_1}{AB_1} * BB_1$ join CD and prolong.

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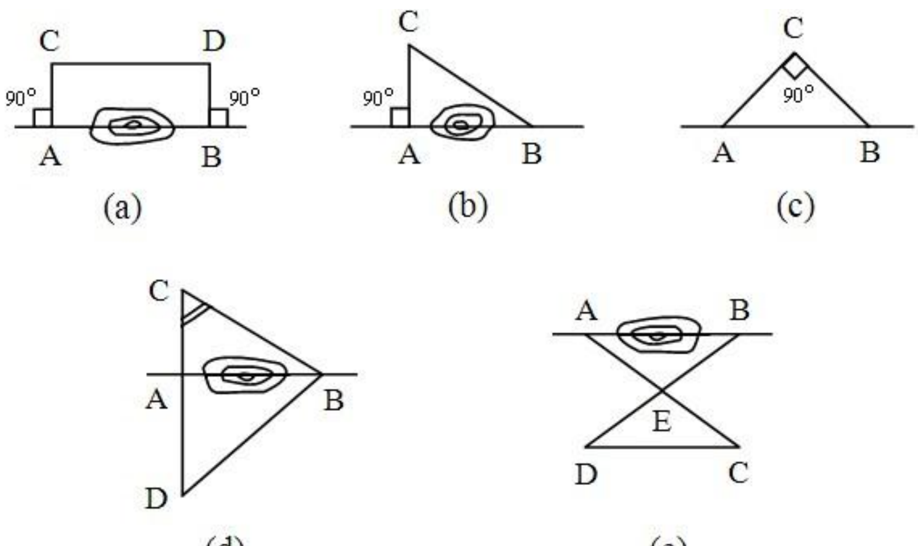
Obstacles to chaining but not ranging:

There may be two cases of this obstacle:

i. When it is possible to chain round the obstacle ,i.e. a pound, hedge etc.
ii. When it is not possible to chain round the obstacle, e.g. a river.

Case (i): following are the chief method, as in figure below.



1. Method (a): select two points A and B on either side. Set out equal perpendiculars AC and BD. measure CD; then CD =AB. [fig. (a)].
2. Method (b): set out AC perpendicular to the chain line. Measure AC and BC. [fig. (b)]. the length AB is calculated from the relation:

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

3. Method (c): by optical square or cross staff. Find a point C which subtends 90° with A and B. measure AC and BC. [Fig. (c)]. the length AB is calculated from the relation:

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

4. Method (d): select two points C and D to both sides of A and in the same line. Measure AC, AD, BC, and BD. [fig. (d)]. let angle BCD be equal to β.

From Δ BCD,

$$BD^2 = BC^2 + CD^2 - 2BC \times CD\, cos\theta$$

$$cos\theta = \frac{BC^2+CD^2-BD^2}{2BC\times CD} \qquad \text{.......(i)}$$

Similarly fromΔ BCA

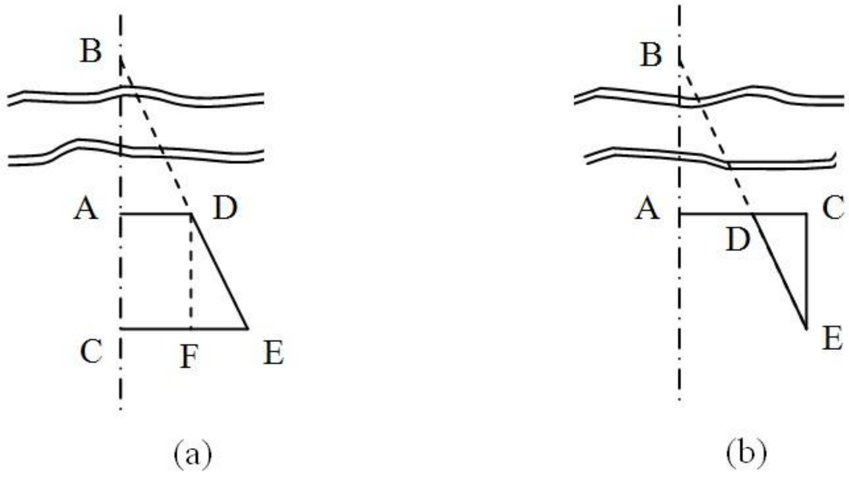
$$cos\theta = \frac{BC^2+AC^2-AB^2}{2BC\times AC} \qquad \text{.......(ii)}$$

Equation (i) and (ii) and solving for AB, we get

$$»»AB = \sqrt{\frac{(BC^2 \times AD) + (BD^2 \times AC)}{CD} - (AC \times AD)}$$

5. Method (e): select any point E and range C in line with AE. Making AE=EC. Range D in line with BE and make BE=ED. measure CD; then AB=CD. [fig. (e)].

Case (ii): as shown in figure below,



6. Method (a): select point B on one side and A and C on the other side. Erect AD and CE as perpendiculars to AB and range B. D and E in one line. Measure AC, AD and CE. [Fig. (a)], if a line DF is drawn parallel to AB, cutting CE in F perpendicularly, then triangles ABD and FDE will be similar.

$$\therefore \frac{AB}{AD} = \frac{DF}{FE}$$

But FE = CE – CF = CE - AD, and DF = AC.

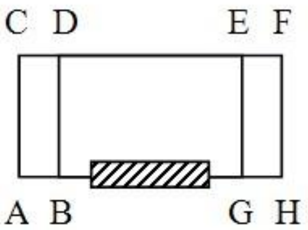
$$\therefore \frac{AB}{AD} = \frac{AC}{CE - AD}$$

From which $AB = \frac{AC \times AD}{CE - AD}$.

7. Method (b): [fig. (b)]. erect a perpendicular AC and bisect it at D. erect perpendicular CE at C and range E in line with BD. measure CE then AB = CE.

3. ***Obstacles to both chaining and ranging:***

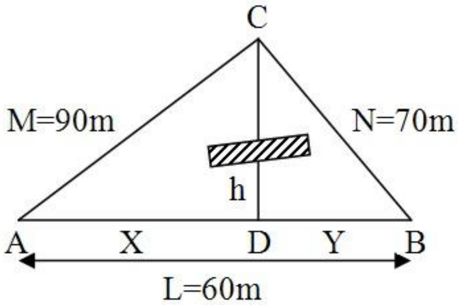
A building is the typical example of this type of obstacle. The problem lies in prolonging the line beyond the obstacle and determining the distance across it. The method is: as shown in figure below, choose two points A and B to one side at erect perpendiculars AC and BD of equal length.



Join CD prolong it past the obstacle. Choose two points E and F on and erect perpendiculars EG and FH equal to that of AC (or BD). Join GH and prolong it. Measure DE. Evidently, BG=DE as figure below.

Example

Compute the length of the perpendicular dropped from point C to the chain Line AB. Using field data as in figure below.



Answer:

$CD^2=AC^2-AD^2$

$CD^2=BC^2-BD^2$

$AC^2-AD^2=BC^2-BD^2$

$AC^2-BC^2=AD^2-BD^2$

$M^2-N^2=X^2-Y^2$

$(M-N)(M+N)=(X-Y)(X+Y)$

$X-Y=(M-N)(M+N)/(X+Y)$

$$\therefore X-Y=\frac{(M-N)(M+N)}{L}=\Delta$$

$+X+Y=L$

$\underline{\mp X \pm Y=\mp\Delta}$

$2Y=L-\Delta$

$$\therefore Y=\frac{L-\Delta}{2}$$

$2X=L+\Delta$

$$\therefore X=\frac{L+\Delta}{2}$$