Types of obstacles in chain Surveying

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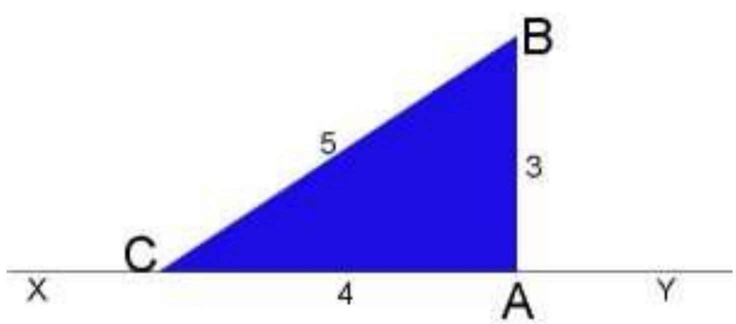
Types of obstacles in chain Surveying and Solutions of obstacles in chain Surveying:

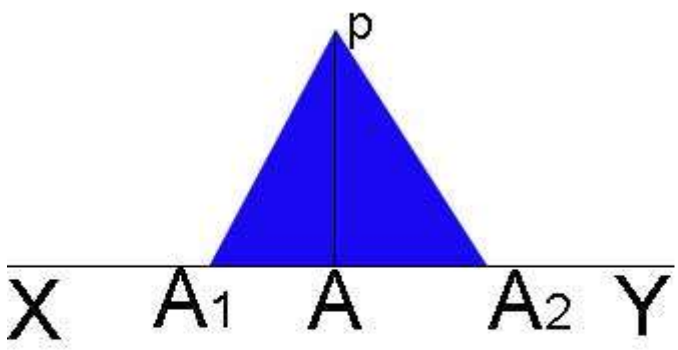
Sometimes it will be observed that many obstructions like rivers, canals, ponds. thick jungles, ditches, buildings, etc. lie on the chain line. These obstacles can be avoided in chaining operation by applying some fundamental geometric rules.

Drawing a perpendicular from a point on the chain line:



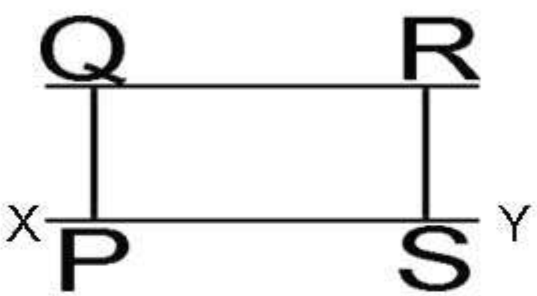
AC is taken 4 units on the chain line XY. AB and BC 3 and 5 units respectively. Then ∠BAC will be 90° at point A on the chain line because if the sum of the squares on two sides of the triangle is equal to the third. The included angle between the two sides is a right angle ($BC^2=AB^2+AC^2$)

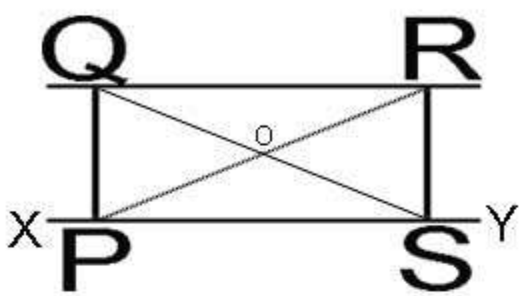
Drawing a perpendicular from an external point of chain line:



XY is the chain line and P is the external point. Keeping the zero end of the tape at P and swinging the tape along the chain line the point of minimum tape length on the chain line is noted which should be the foot of the perpendicular. Because the perpendicular is the shortest distance.

Drawing a line parallel to the chain line:

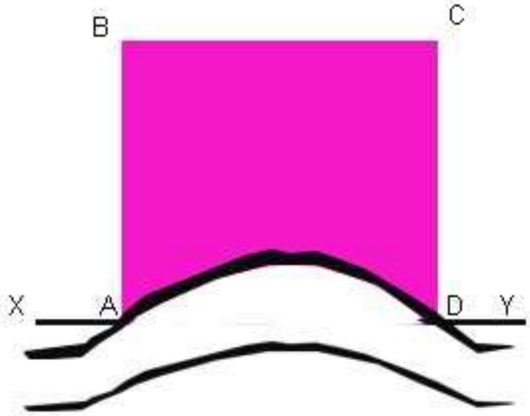


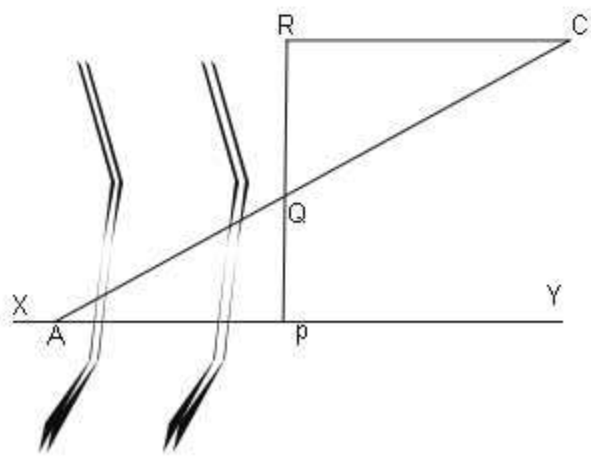


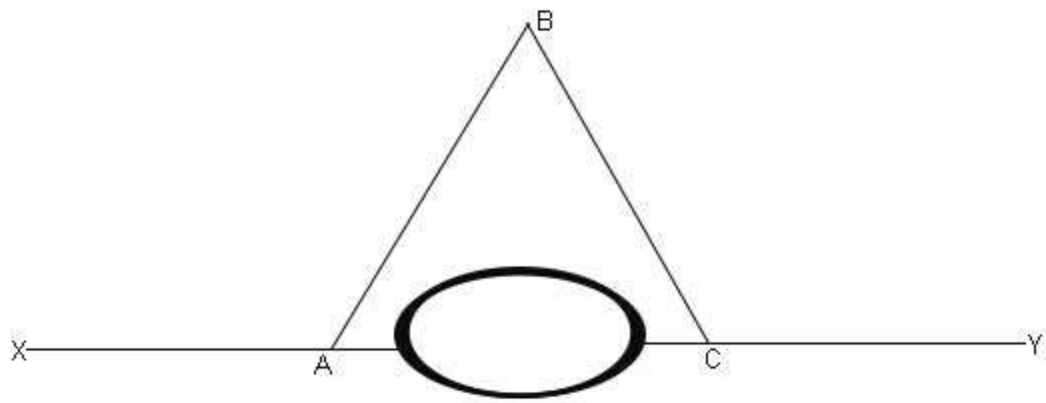
Let XY be the chain line and Q is a point through which a line parallel to the chain line is to be drawn. From Q, perpendicular QP is drawn on XY at P. Point R is now selected on XY and RS is drawn the perpendicular to XY at R in such a way that RS=PQ; QS is joined which is now parallel to XY.

In Fig (b), point R is selected on XY. QR is joined and bisected at O. Another point P on XY is selected and PO is joined. Now PO is extended to S so that PO=OS. QS is joined. QS is parallel to XY.

The following are the geometrical figures by which. chaining can be done in spite of obstacles lying on the chain line.

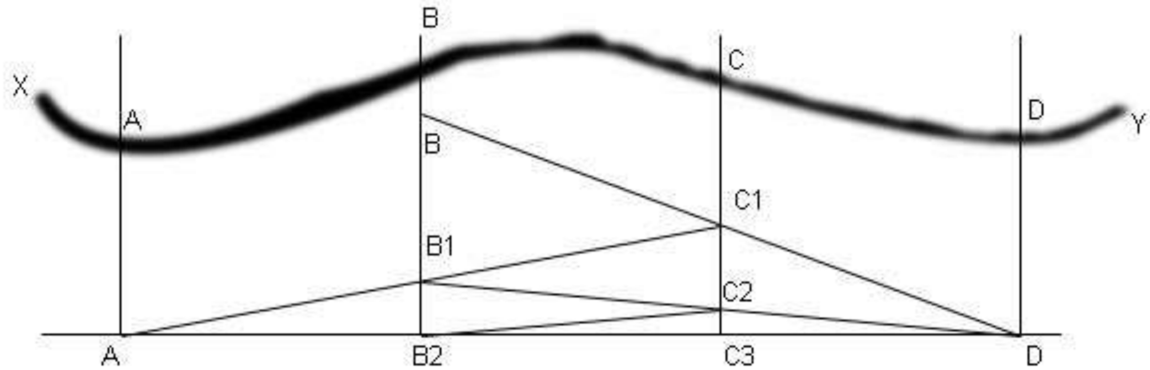


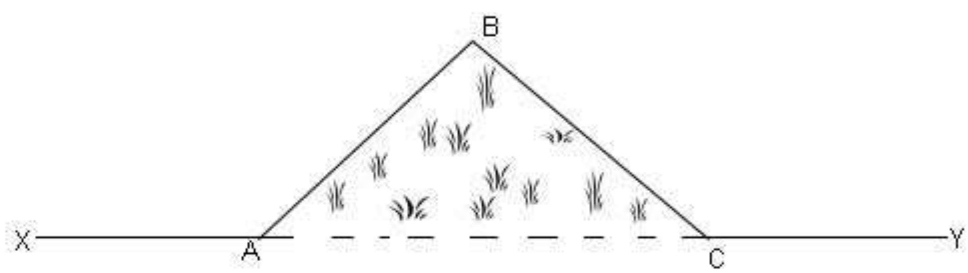




How chaining operation can be done when it is obstructed by a bend of a canal, has been shown in above fig (a) which is self-explanatory.

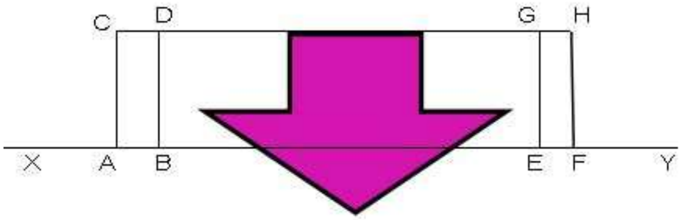
Fig (b) shows the procedure of chaining operation when it is obstructed by a river. A and P are the two points close to the bank on opposite sides of the river. At P a perpendicular PR is drawn. Q is the midpoint of PR, At R again a perpendicular RS is drawn. Point S is fixed by extending AQ. From two similar triangles APO and QRS, RS=AP.

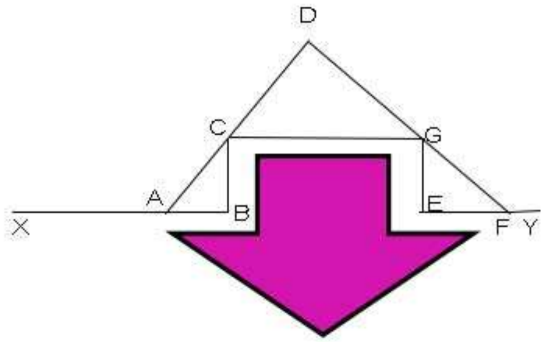




The first figure shows the method of chaining when it is obstructed by a hill or ridge. A and D are the foot-hill points, each hidden from view of the other on the either side of the hill. Points B and C are chosen in such a way that a man at B can easily see ranging rods at C and D, while at C, can see the ranging rods at B and A. Now C puts B in the line with A, and B puts C in the line with D. Hence, A, B, C, D are in the same line. If the hill is wide enough, then it can be chained in the usual manner. The method is also known as reciprocal ranging.

The second figure shows chaining through a thick wood. The figure is self-explanatory. From the Fig we found that $AC^2= \sqrt{(AB^2+BC^2)}$.



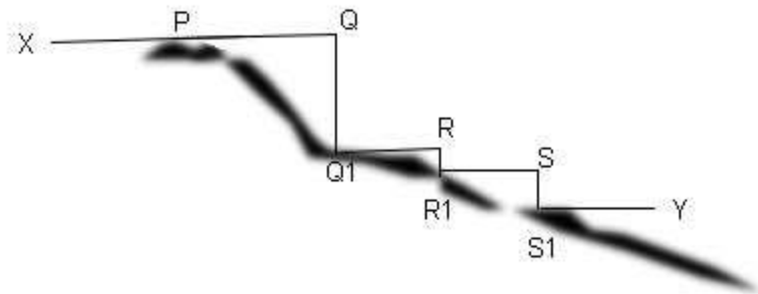


The above figure shows the chaining across a building.
In fig (a) two points A and B are taken on the chain line and two perpendiculars AC and BD of equal length are erected. The diagonals AD and BC which should be equal, are checked to have the correct result. The line CD is produced past the building and two points G and H are taken on it. Two perpendiculars GE and HF equal in length to Ac or BD are drawn.

In this case also diagonals GF and HE are checked. Now ABEF is a straight line and DG=BE.

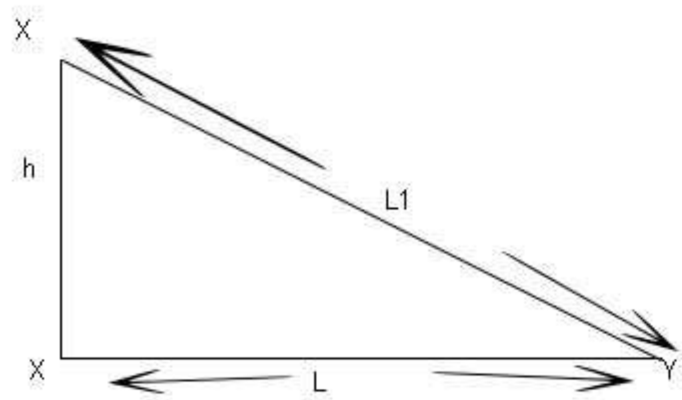
Another method has been shown in Figure (b) Where e point B has been taken on the chain line and Perpendicular BC erected. A is another Point on the chain line so that BC=BA. This makes the angle BAC=45°. AC is joined and extended to D which is roughly opposite the middle point in the length of the building. At D, a perpendicular DF is set to AD, Making DF=DA, On DF, Point G is taken in such a way that DG=DC. By the procedure, explained above ∠GFE is made 45°. Points E and F lie on the straight line AB produced. Now CG=BE.

Chaining along the sloping ground:



First method: During chaining along a sloping surface, the horizontal projection or a chain line is found by the process shown in above Figure.
In this method, a portion of the chain, 15 ft to 30 ft is generally used. The length of the chain, of course, depends upon the steepness of the sloping surface. The chain is held horizontally with zero ends of it at P on the ground, while the point Q1 vertically below the other end of the Chain at Q is found by means of a drop-arrow.

The next step is commenced from point Q1 and the process is continued until the whole horizontal distance is measured. This method is also known as stepping.



Second Method:

In this method, the sloping length and the angle of inclination are measured and the horizontally projected length is calculated mathematically.

From Figure The xy=L1=measured distance along the slope, ZX=h and θ=angle of inclination, which is measured by instruments such as Clinometer. Abney level, etc.

$\text{Cos}\theta = L / L1$

so, $L = L1\ \text{Cos}\theta$

Third Method:

If the difference of height h between the points X and Y are known (Using leveling instrument), L can be calculated.

$L=\sqrt{(L1^2-h^2)}$

Example: The distance between two points X and Y measured along a sloping surface is 12.4 chains. Calculate the horizontal projected distance when the angle of inclination is 10°30'. Also find the same when elevations of X and Y above mean sea-level are 740 and 840 respectively.

$L = L_1 \, \cos\theta = 1240 \cos 10°30' = 1220$ ft.

Again, $L = \sqrt{(L_1^2 - h^2)} = \sqrt{((1240)^2 - (840-740)^2)}$

$= 1237$ ft.