

SECTION 52 – SETTING OUT TANGENTS

1147. **Location of tangents.** Points on the tangents are marked on the ground by measuring offsets from the traverse lines or from well-defined features. If possible fix about six points on each straight. Sight along the most acceptable mean and drive in a peg (fixing a nail on top if using a theodolite) at a suitable distance.

1148. **Location of IP.** Having fixed one tangent, range in the adjoining tangent using banderoles and drive two pegs in continuation of the sight line, one on either side of the approximate intersection with the first tangent. Fix the exact position of the IP, between these pegs, by sighting along the first tangent.

1149. **Location of tangent points.** Tangent points are fixed by measurement from the IP, the tangent lengths depending on the radius of the curve, R.

- a. **Accurate method.** Set up over the IP and sight along one straight. Swing to the line of sight of the other straight, so as to measure the exterior angle (see Figure 6) which is 180^0 minus angle of swing. If the angle as measured is within two degree of the paper location Figure,

$\frac{\Delta}{2}$

calculate the tangent length from the formula. $t = R \tan \frac{\Delta}{2}$.

If the agents do not agree within two degrees, check the setting out of the straining. If they are found to be correct, the curve must be adjusted so as best to suit ground conditions.

- b. **Simple method (see Figure 11.14).** To find the tangent length, t, fix the IP at I and choose two points on the tangents, at F and G, equidistant from I. Measure FG and fix its middle point H.

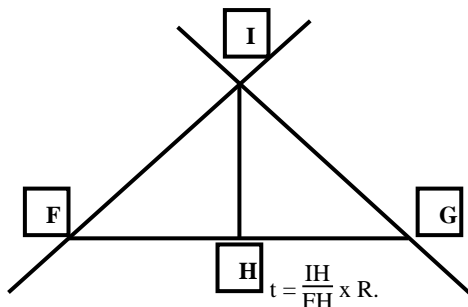


Figure 11-14: Simple Method of Fixing Tangent Points.

Special Cases

1150. **Locating a straight over a hill.** If two neighboring fixed points, X and Y cannot be seen from each other, because of intervening high ground, intermediate points on the connecting straight can be fixed by using two banderoles, A and B as follows, provided that the intervening high ground is not unduly convex (see Figure 11.15):

- a. Erect banderole A at A1 on the approximate alignment as judged by eye, within sight of Y and just within sight of X.
- b. From X line in banderole B at B1 with banderole A at A1, so that B1 is just within sight of Y.
- c. From Y line in banderole A at A2 with banderole B at B1 so that A2 is just within sight of X.
- d. Repeat this process alternately from X and Y until no further movements are necessary. X, Bn, An, and Y will then be in a straight line.

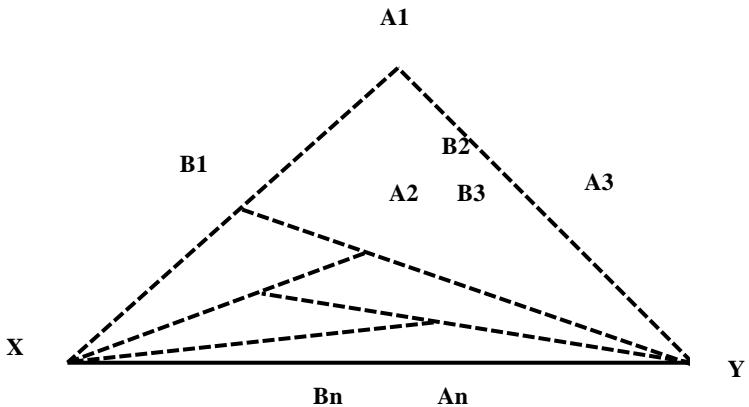


Figure 11-15: Locating a Straight Over a Hill.

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1151. Inaccessible intersection point. If the IP cannot be fixed on the ground because of some obstruction the tangent points can be fixed in the following way (see Figure 11.16):

- a. Select points A and B, one on each tangent which are visible from each other.
- b. Measure AB at least twice, and more often if necessary to get a satisfactory mean.
- c. Observe the angles XAB and ZBA. Angle IAB = $180^\circ - \text{XAB}$. Angle IBA = $180^\circ - \text{ZBA}$ Angle $\Delta = \text{IAB} + \text{IBA}$
- d. The length AB is known from measurement and the

Angle AIB = $180^\circ - \text{IAB} - \text{IBA}$. The lengths AI and BI can now be found from the formula

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

- e. Calculate the tangent lengths from the usual formula $t = R \tan \frac{\Delta}{2}$. As the lengths AI and BI are now known, the tangent points can be fixed by measurement from A and B.