Surveying-II Lab Manual

6TH SEMESTER

(CIVIL ENGINEERING)

DEPARTMENT OF CIVIL ENGINEERING

GOVERNMENT POLYTECHNIC NABARANGAPUR

EXPERIMENT –1

AIM: to determine the Elevation of an inaccessible point when base is not accessible :

INSTRUMENTS REQUIRED: Theodolite, tripod, tape , ranging rods, plumb bob etc.

PROCEDURE:

Let A be the inaccessible point A whose elevation is to be determined

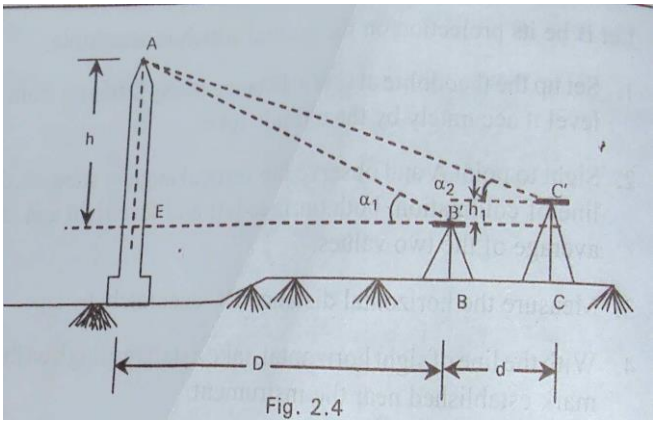


Fig. 2.4

1) Set up the theodolite at station B at a convenient position so that the object A can be sightedand level the instrument accurately by the altitude level.
2) Sight the object and read thevertical angle EB'A=α_1.
3) With both motions of plates clamped, plunge the telescope and mark a station C in the line of sight at a suitable distance d from B so that points, A, B, C lie in the same verticalplane.
4) With line of sight horizontal, take the staff readings s_1 on a nearby B.M. to establish the R.L. of the plane of collimation.
5) Shift the instrument and set it up exactly over C and level it accurately.
6) With line of sight horizontal, take the staff reading s_2 on the B.M. to establish the level ofplane of collimation at C.
7) Sight object A, bisect it accurately and read the vertical angle α_2

   to A form C, $h=AE.\tan\alpha_1$

   $h= (h_1+d \tan \alpha_2) \tan \alpha_1/\tan\alpha_1-\tan \alpha_2$

R.L of A =R.L of B.M + staff reading s_1+h

Note: if line of collimation is higher at B than at C,value of d must be taken as negative.

EXPERIMENT –2

AIM: To determine the multiplying constant and additive constant of a given tacheometer.

EQUIPMENTS:

Tacheometer, Ranging Rods, Levelling Staff, Tape, Pegs

PROCEDURE:

The stadia interval factor (k) and the stadia constant (c) are known as tacheometric constants. Before using a tacheometer for surveying work, it is required to determine these constants. These can be computed from field observation by adopting following procedure.

Step 1: Set up the tacheometer at any station say P on a flat ground.

Step 2: Select another point say Q about 200 m away. Measure the distance between P and Q accurately with a precise tape. Then, drive pegs at a uniform interval, say 50 m, along PQ. Mark the peg points as 1, 2, 3 and last peg -4 at station Q.

Step 3: Keep the staff on the peg-1, and obtain the staff intercept say s_1.

Step 4: Likewise, obtain the staff intercepts say s_2, when the staff is kept at the peg-2,

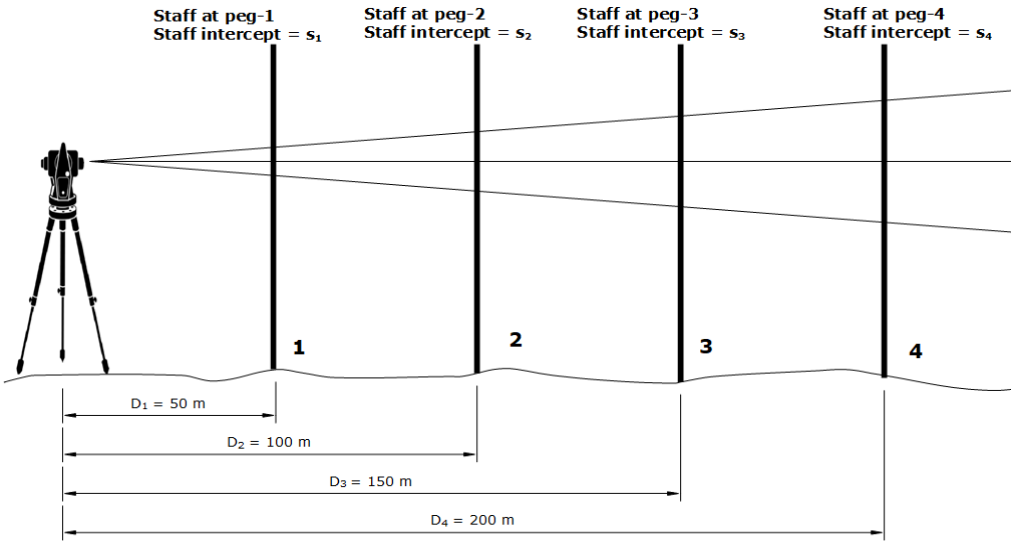
Step 5: Form the simultaneous equations, using

Equation $D = ks + c$ $D_1 = k\,s_1 + c$ --------- (i) and

$D_2 = k\,s_2 + c$ ---------- (ii)Solving Equations (i) and (ii), determine the values of k and c.

Step 6: Form another set of observations to the pegs 3 & 4, Simultaneous equations can be obtained from the staff intercepts s_3 and s_4 at the peg-3 and point Q respectively. Solving those equations, determine the values of k and c again.

Step 7: The average of the values obtained in steps (5) and (6) provide the tacheometric constants k and c of the instrument.



EXPERIMENT – 3

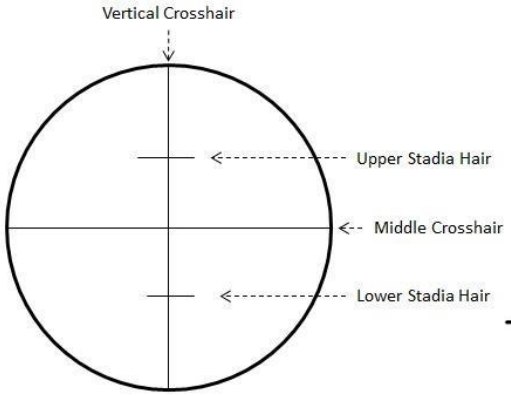
Aim: To determine the horizontal distance between two points on plane ground using theprinciples of stadia tacheometry.

Instruments and accesories required:

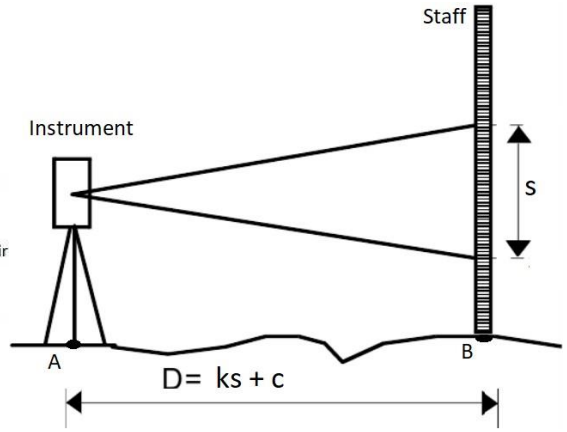
Tacheometer, Tripod Stand, Levelling Staff, Pegs, Arrows, etc.Tacheometric constants: k = 100, c = 0

Theory:

A number of commonly used optical surveying instruments can be used for the purpose of tacheometry. A theodolite is the most preferred choice though. The only requirement for a theodolite to be a tacheometer is that the diaphragm of its telescope should possess upper and lower stadia hairs.



Diaphragm with stadia



Calculating staff intercept

Procedure:

1. Let the two stations between which we have to find the distance be A and B.
2. Mount the theodolite on the tripod stand.
3. Then center it over station A and also level it.
4. Make the line of sight of theodolite horizontal.
5. Place a levelling staff in the vertical position on station B.
6. Through the telescope sight this staff and properly focus the image using object focusing screw. Alsomake the stadia clearly visible by adjusting the eyepiece.
7. Note down the readings on levelling staff corresponding to upper and lower stadia.
8. Find the staff intercept, s by finding the difference between these two readings.
9. Calculate the distance by using the tacheometric distance equationD = ks + c
   Since the constants are known to us (k=100, c= 0)D = 100s

EXPERIMENT NO-4

Aim:

To set out the simple curve of given radius and length of long chord by means ofoffsets from the long chord.

Equipment:

Theodolite, Tripod Stand, Cross-Staff, Ranging Rods, Pegs, Chain and Tape.

Principle:

Setting out a curve by method of offsets from long chord is linear method. It involves setting out the normal offsets of the long chord at specified intervals and joining them.

The length of offsets at any distance 'x' from the mid points of the long chord is given by

$$O_x = \sqrt{R^2 - x^2} - \sqrt{R^2 - \left(\frac{L}{2}\right)^2}$$

Where Ox = length of offset at a distance 'x' from the mid of long chord.

X = specified distance between offsets.

L = length of the long chord.

R = Radius of the curve

$$O_o = R - \sqrt{R^2 - \left(\frac{L}{2}\right)^2}$$ (Mid Ordinate)

Usually, the offsets from the mid of long chord towards the end are setout and the curve is symmetric over the central offset line.

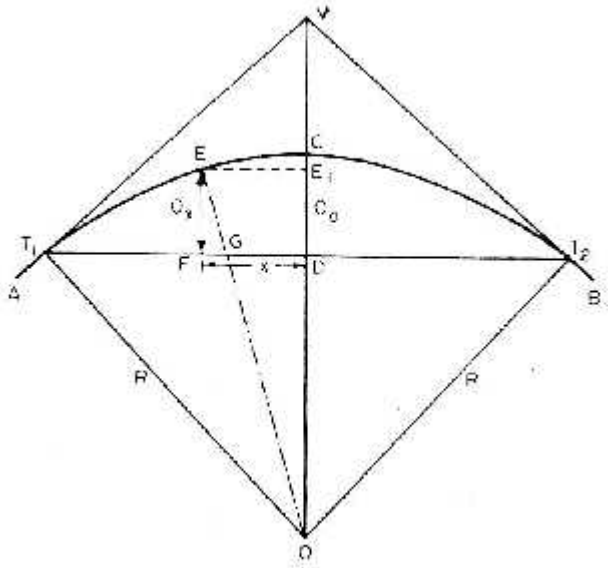
Procedure:

1. The obtained length of long chord is first set out on the field by proper ranging and mid point is established (Fig.10)
2. The length of offsets at mid length is to be setout. For this, a person holds the cross-staff at required point and aligns the slit with the end station ranging rods. At this instant another person looks through the normal slit and guides a person with a ranging rod to come into its view thus along this line normal to long chord, the calculated offset is setout.
3. The cross staff is shifted to next point distance 'x' as specified and above step is repeated the offset corresponding to that distance is set out from that point.
4. Pegs are marked at the end of the offsets, the joining of which completes the setting.

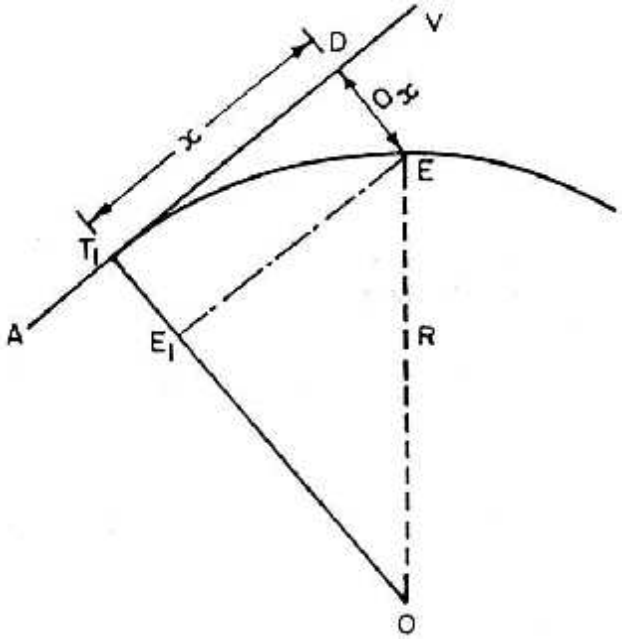
Observations and Calculations:

Distance (X m) =

Ordinate (Y m) =



(a) Setting Out By Ordinates from the Long Chord



(b) Setting Out By Perpendicular Offsets

Result:

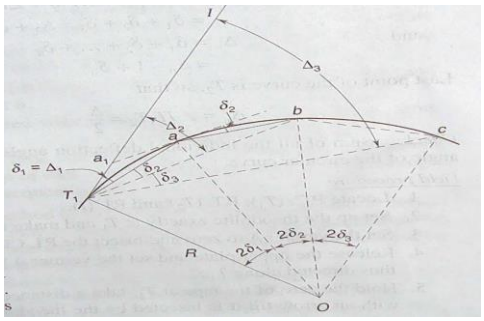
The simple curve is set out by the method of offsets from long chord in the field.

EXPERIMENT-5

AIM: Setting out a simple circular curve by offsets from the tangent

INSTRUMENTS REQUIRED: Theodolite, tape, tripod etc.

FIELD PROCEDURE:



1) Locate P.C. (T_1), P.T (T_2) and P.I. (I).
2) Set up the theodolite exactly at T_1 and make its temporary adjustments.
3) Set up vernier A to zero and bisect the P.I Clamp thelower plate.
4) Release the upper plate and set the vernier A to read Δ_1. The line of sight is thus directed along T_1a.
5) Hold the zero tape at t_1, take a distance C_1 (T_1a) and swing the tape with an arrow till it isbisected by the theodolite. This establishes the first point in the curve.
6) Set the second deflection angle Δ_2. On the scale so that lime of sight is set along T_1b.
7) With zero of the of the tape held at a and an arrow at the other end (chord distance=ab), swing the tape about a, till the arrow is bisected by the theodolite at b, this establishes thesecond point b on the curve.
8) The same steps are repeated till the last point T_2 is reached.