SURVEY PRACTICAL LABORATARY MANUAL

SUB:CODE - 407

TACHEOMETRY

Tacheometry is the branch of surveying in which horizontal and vertical distances are determined by taking angular observations with an instrument called tacheometer. Tacheometric surveying is adopted in rough and difficult terrain where direct leveling and chaining are either not possible or very tedious.

Purpose of tacheometric surveying:

The primary object of tacheometry is the preparation of contoured plans.It is considered to be rapid and accurate in rough country and has thus been widely used by enginners in location surveys for railways,canal,reservoirs.

Whenever surveys of higher accuracy are carried out tacheometry provides a good check on distance measured with a tap or chain.

Instruments used for tacheometric survey:

1)Tacheometer: A tacheometer is a transit thoedolite fitted with a stadia diaphragm and analletic lens.The stadia diaphragm consists of one stadia hair above and below the horizontal cross hair.The stadia hairs are kept in the same vertical plane.

2)Stadia rod:For the short distances say upto 100 m ordinary leveling staves may be used.For greater distances the stadia rods 3 to 5 m in length are generally used.

Systems of Tacheometric measurements:

It may be classified as

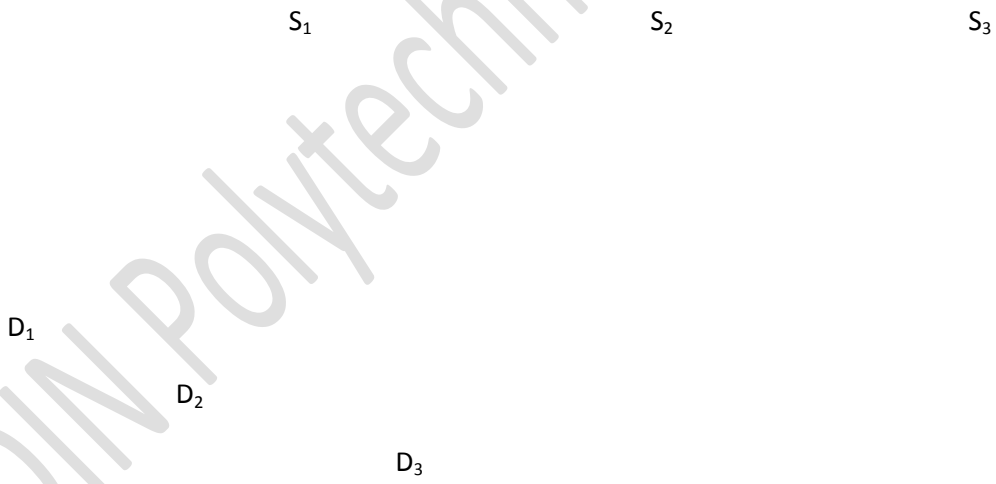
1)The stadia hair system

2)The tangential hair system

The stadia hair system may further be divided into 2 types,

a)Fixed hair method b)Movable hair method

The principle of Tacheometry is based on the property of Isosceles triangles,where the ratio of the base from the apex and the length of the base is always constant.



So according to the principle,

$$D_1/ S_1 = D_2 / S_2 = D_3/ S_3 = f/ i \text{ (a constant)}$$

The Constant f/i is known as multiplying constant where f is the focal length of the objective and I is the stadia intercept.

TACHEOMETRIC CONSTANTS

Aim

To determine the stadia constants of tacheometer

Instruments Required

Theodolite withtripod

Levelling staff

Tape

Peg

Principle

These work is based on the principle of stadia method

The constants are obtained by using the equation

$D=KS$

D=Horizontal distance

K=Multiplying constant

S=Staff intercept

C=Additive constant

Procedure

1.Measure accurately a line OC about 60m long on a fairly level ground and fix the pegs alaong it,at intervals of,say 20m

2.Set up the theodolite over the station mark O and leveled it accurately

3.Set the vernier c and D 0 exactly vertical clamping screw

4.Then obtained the staff intercepts by taking stadia reading on the staff held vertically at each of the pegs

5.Subtitute two values of D and S in equation D=KS and find the stadia constants of tacheometer

6.Check the values by other value of S

Observation and calculation:

Instrument At	Sight to	FL Observations			Staff intercept	Interval
		Top	Center	Bottom		

Result

Found out the contants of tacheometer

K=

C=

TANGENTIAL TACHEOMETRY

Aim

To find the gradient of given two inaccesible point A and B by tangential tacheometry

Intruments Required

Theodolite with tripod,Ranging rods,Peg

Principle

This work is based on the principle of tangential system and the horizontal distance OA and OB was calculated by using equation

OA=D1=S1/tan1

OB=D2=S2/tan1-tan2

The unknown distance AB was calculated by applying cosine rule,AB=OA2OA.OB.CosΘ

v1=OA tanΘ

v2=ob tanΘ

Level difference= V2-V1

Procedure

1.Set up the instrument over station point O and level it accurately reference to the altitude bubble

2.Set the vernier A and B 0 by using upper clamping screw and its tngent screw

3.Direct the telescope towards the point A,a ranging rod is fixed the ponit A and a known distance 2m marked on the ranging rod two srips

4.Then the angle of elevation of say alpha 1 to the point A and also found the angle of elevation of top most ponit of ranging rods to the point A the angles are noted

5.Then turn the telescope in clockwise direction by using upper clamp screw and its tangent screw over the elevated ponit B(A ranging rod is fixed at the point B and a known distance 1m is marked as B and B)

6.Bisected the top point B and note the horizontal angle by reading vernier A and B

7.Then sighted the point B B and noted the vertical angle---

8.Turn the telescope in clockwise direction and bisect the point A using lower clamping screw, and find out the horizontal angle by repetation method

9.The above procedure is repeated by changing the face of instrument

Observation and Calculation:

Inst at	Sight to	Face left Right swing												Face Right Right swing											
		C			D		MEAN			Included Angle				C			D		MEAN			Included Angle			
		°		"	°	"	°		"	°		"		°		"		"	°		"		°		"	

Inst at	Sight to	Face left Right swing												Face Right Right swing											
		C			D		MEAN			Included Angle				C			D		MEAN			Included Angle			
		°		"	°	"	°		"	°		"		°		"		"	°		"		°		"	

Instr at	Sight to	Top	Center	Bottom	Staff Intercept

Result

The Horizontal distance between A and B=

Level difference between A and B=

Gradient of line AB=

STADIA TACHEOMETRY

Aim

To find the horizontal distance between A and B

To determine the level difference between the point A and B

To determine the gradient of line AB

Instruments Required:

Theodolite with tripod,Levelling staff,Pegs

Principle

These work is based on the principle of stadia method and cosine rule

Procedure

1.Set up theinstrument over the station point and levelled it accurately with respect to the altitude bubble

2.Set the vernier c to read 0 by using vertical clamping screw and its tangent screw

3.And sight to the staff station B and stadia hair readings were taken

4.Then loosen the vertical clamping screw and lower clamping screw and sight to the staff station A bisect it exactly using its tangent screws

5.And stadia hair reading were taken,and also the vertical angle was noted by reading vernier C and D

6.Then loosen the upper clamp and set the vernier A to 0 exactly by using its tangent screw

7.Then loosen the lower clamp and sight to the staff station A exactly by using its tangent screw

8.Then upper clamp was loosen and sight to the staff station B exactly by using its tangent screw

9.And note the vernier A and B angle measured by repetition method ,and horizontal angle AOB is calculated by dividing final observed angle with no.of repetation

10.Change the face of the instrument and all the observations are taken by using same procedure

11.Then mean of the two face observations are taken

12.The distance OA and OB was determined by using the tacheometric equation

13.The unknown distance AB was calculated by applying cosine rulein the triangle

14.Then level difference between A and B was calculated

Result

The horizontal distance between A and B=

The level difference between A and B=

The gradient of given line AB=

CURVE SETTING

BY TAKING OFFSETS FROM LONG CHORD

Aim

To set out a simple curve by taking offsets from long chord

Instruments Required

Theodolite with tripod,Levelling staff,Pegs

Procedure

1.Set out the length of long chord T1 T2 on the ground

2.Erected the ranging rods at T1 and T2

3.Divided the long chord t1t2 in equal parts of suitable length,say 5m

4.Calculated the mid-ordinate and the length offset corresponding the distance from the midpoint of the curve

5.Erected the perpendicular with the help of a cross staff and fix a peg in calculated offset distance and join the points to get required curve

Result

A simple curve was set out by taking offsets from long chord

BY RANKINES DEFLECTION METHOD

Aim

To set out a simple curve by rankines deflection method

Instruments Required

Theodolite with tripod,Ranging rods,Tape,Arrows

Principle

This work is based on the principle of rankines method of tangential or deflection angles,Length of the curve

Where

R=radius of curvature

Θ =Deflection angle

Procedure

1.Calculated the sub chord and normal chords.deflection angles for all chords

2.Set the theodolite at the point of curve(T1)with leveled accurate using footscrews

3.Set the vernier A 0 exactly by using upper clamp screw and its tangent screw.Then direct the theodolite towards the point of intersection I and bisect it accurately,Then the line of sight is directed alo

Ng the back tangent T1I

4.Realese the upper plate and set the angle A1 on vernier A,Then line of sight is directed along the line T1A

5.With the 0 end of the tape pointed at T1 and a arrow held at distance

,T1A equals to the length of the first sub chord along it.swing tape around T1,till the narrow bisected cross thus the first point A is fixed

6.Set the second deflection angle A2 on the vernier A ,so that the sight is directed to T1B

7. .With the 0 end of the tape pointed at A and a arrow held at distance

,AB equals to the length of the first nrmal chord along it.swing tape around A,till the narrow bisected cross thus the second point Bis fixed

8.Repeat the procedure till last point is reached

9.Join all the points to get required simple curve on the ground

Result

A simple curve was set out by using Rankines deflection method