DRONACHARYA GROUP OF INSTITUTIONS, GREATER NOIDA
Department of CIVIL Engineering
Semester: III
Branch: CIVIL   Session: 2015-16
Subject: Surveying Lab

1. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.

2. To find out reduced levels of given points using dumpy/Auto level.

3. To perform fly leveling with a Auto /tilting level.

4. To measure horizontal angle by method of reiteration

5. To measure horizontal angle between two objects by repetition method with three repetitions.

6. To measure direct angle, deflection angle and magnetic bearing of line by using theodolite

7. To measure vertical angle of given points by Electronic theodolite.

8. To set out a simple circular curve by Rankine's method

INDEX

PRACTICAL NO: 1

Objective: **To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.**

Apparatus: Prismatic compass, pegs, ranging rods etc

Theory: Definition: Surveying which involves series of connected lines is known as traversing The sides of traverse are known is known as Traverse legs.

In traversing with a compass free or loose needle method is employed to determine direction of survey line. The compass is setup at each of the successive station and fore & back bearing of each line is determined All the readings are noted in field book. Each of the line is observed independently & errors are calculated, compensated. The field work consists of primary survey, marking of stations, running of traverse lines.
Traverse stations should be selected that

    I)   They are visible from each other
    II)   They are as long as possible.
    III)   The line joining them are as near the boundaries &
          objects To be located as possible

Procedure:
Let us say we have to run a closed compass traverse ABCDEA. Set the prismatic compass at point A. center it and level it.
1. Take bearings of traverse lines AB and AE.
2. Shift the compass to point B center it and level it. Take the bearings BC and BA.
3. Link-wise complete the traverse as shown in fig (a).
4. Measure the length of traverse line AB, BC, CD, DE, and EA.
5. Record the observation in tabular columns.
6. Care must be taken to see that the stations are not affected by local attractions. If they are affected corrections to local attractions should be applied first and Then the traverse should be plotted with corrected bearings.
7. Simplest method of plotting is angle and distance method with a protractor. If Last point is falling short by some distance in meeting the first point then it means that there is a closing error.

So, traverse should be adjusted by "Bow ditch's graphical method"

S.No	Station point	Line	Fore bearing	Back bearing	Difference	Correction at Station	Corrected fore bearing

Corrected Back	Included Angle	Correction	Corrected Angle

PRACTICAL NO: 2

OBJECTIVE: To find out reduced levels of given points using dumpy/Auto level.

Apparatus:- Dumpy level, tripod stand, leveling staff etc.

Theory:-The dumpy level is a simple and compact instrument; the telescope is rigidly fixed to its supports it can be rotated about its longitudinal axis. Level tube is permanently placed so that axis lies in same vertical plane. A focusing screw near the eye piece provided to get clear image of the object and to Bisect cross hair.
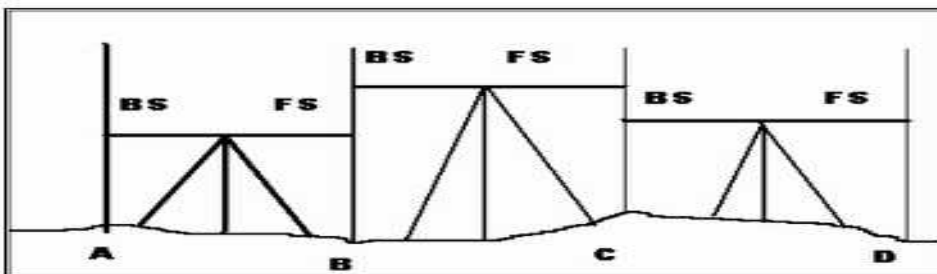
Reduction of levels
H.I method:-

The reduced level of the line of collimation is said to be the height of the instrument. In this system height of the line of collimation is found out by adding back side reading to the R.L of bench mark on which BS is taken. Then RL of intermediate points and the change point are obtained by subtracting the respective staff reading from the height of instrument (HI). To find new HI of change point BS is taken on last point.

Procedure:
Let A and B be the two given points whose difference is elevation is to be found.

Set the level at convenient point carryout temporary adjustments and take B.S on A

1. Take FS on the Point C
1. Shift the instrument to point O2 and perform temporary adjustments.
2. Take B.S on C.
3. Take F.S. on D.
4. Shift the instrument to point O3 and perform temporary adjustments.
5. Take B.S on D
6. Take F.S on B.
7. Find the difference in elevation between A and B by both the methods.

Observation Table:

Station point	Chainage	BS	IS	FS	RL of collimation		Remark

Result: Level Difference between A & B is …………..

PRACTICAL NO: 3

Objective: To perform fly leveling with an Auto /tilting level.

Apparatus: Dumpy level, Telescope Staff, Tripod.

Theory: Fly leveling is done to calculate RL of a particular point from the known bench mark e.g. in fig showing R.L of particular point is A is calculated taking back sight on BM & F.s on A.

PROCEDURE:
1. Set up the level on the tripod at a convenient height and bring the foot screws approximately to the middle of its rim.
2 .By temporary adjustments bring the bubble at centre open out typical leveling field book columns.
3. Sight the given points and take the staff reading and note down the readings at the appropriate columns.
4. If there are any points for away and is not clearly visible take. A change point and the leveling is continued.
5. After finishing the leveling, calculate the elevations by the rise and fall method and apply necessary checks.

Observation:

Back Sight	Intermediate sight	Fore sight	Height of Instrument	Reduced Level	Remarks (B.M.)

PRACTICAL NO: 4

Objective: **To measure horizontal angle by method of reiteration**

Apparatus: Theodolite, ranging rods and arrows.

Theory: Reiteration is a method of measuring horizontal angles with high precision. It is less tedious and is generally preferred when there are several angles to be measured at a station. Several angles are measured successively and finally the horizon is closed. Closing the horizon is the process of measuring the angles around a point to obtain a check on their sum which should be equal to 360^0.

Procedure:

1. Select a station point O.
2. Set the theodolite at O and do the temporary adjustments. The telescope is adjusted for right face right swing.
3. Set the vernier A to zero using upper clamp. Loosen the lower clamp, direct the telescope to the station point A and bisect A exactly by using the lower clamp and lower tangent screw.
4. Note the vernier readings (A and B).
5. Loosen the upper clamp and turn the telescope clockwise until the point B is exactly bisected.
6. Note the vernier readings (A and B).
7. The mean of the two vernier readings gives the value of <AOB.
8. Bisect all the points successively and note the readings of both verniers at each bisection.
9. Finally close the horizon by sighting the station point A. The A vernier The A vernier should be 3600. If not, note the closing error.
10. Adjust the telescope for left face left swing.
11. Repeat the whole process by turning the telescope in anticlockwise direction.
12. Distribute the closing error proportionately the several observed angles.
13. Take the average of face left and face right observations to give the corresponding horizontal angles.

Observation:

Instrument at	Sighted to	Face left Swing right				Face right swing left				Average Horizontal Angle
		A	B	Mean	Horizontal Angle	A	B	Mean	Horizontal Angle	

Result: The following horizontal angles are measure

Experiment 5

Objective: To measure the horizontal angle AOB by repetition method.

Apparatus: Theodolite, ranging rods and arrows.

Theory: The method of repetition is used to measure a horizontal angle to a finer degree of accuracy. By this method, an angle is measured two or more times by allowing the vernier to remain clamped each time at the end of each measurement instead of setting it back at zero when sighting at the previous station. Thus an angle reading is mechanically added several times depending upon the number of repetitions. The average horizontal angle is then obtained by dividing the final reading by the number of repetitions. For very accurate work the method of repetition is used.

Procedure :

1. Select a station point O.
2. Set the theodolite at O and do the temporary adjustments. The telescope is adjusted for right face right swing.
3. Set the vernier A to zero using upper clamp. Loosen the lower clamp, direct the telescope to the station point A and bisect A exactly by using the lower clamp and lower tangent screw.
4. Note the vernier readings (A and B).
5. Loosen the upper clamp and turn the telescope clockwise until the point B is exactly bisected.
6. Note the vernier readings (A and B).
7. The mean of the two vernier readings gives gives the value of <AOB.
8. Loosen the lower clamp and turn the telescope to station point A and bisected A by using the lower clamp and lower tangent screw.
9. Loosen the upper clamp and turn the telescope clockwise until the point B is exactly bisected. Now the vernier reading is twice the value of the angle.
10. Repeat the process for the required number of times (usually 3).
11. The correct value of the angle AOB is obtained by dividing the final reading by the number of repetition.
12. Adjust the telescope for left face left swing.

Observation:

| Instrument at | Sighted to | Face left Swing right | | | | Face right swing left | | | | Average Horizontal Angle |
		A	B	Mean	Horizontal Angle	A	B	Mean	Horizontal Angle	

1. Repeat the whole process by turning the telescope in anticlockwise direction.
2. Take the average of face left and face right observation to give the horizontal angle AOB.

**Result:-** The horizontal angle AOB =

Practical N0.6

Objective - To measure direct angle, deflection angle and magnetic bearing of line by using theodolite

Apparatus: Transit theodolite, ranging rod, peg etc

Procedure:-Set up the theodolite at O and level it accurately set vernier A to 0°0´0˝.Loose the lower

plate and take back sight on A.

    1. Loose upper plate rotate telescope clockwise and bisect B exactly read both vernier.
    2. Plunge the telescope turns the instrument about its outer axis and take back sight on A the reading on vernier A will be same as in Step 1.
    3. Loose the upper plate, turn the telescope clockwise and again bisect B exactly.
    4. Read both vernier. The reading will be twice the previous, <AOB will be obtain by dividing the final reading by 2.

Station	Object	Face	Reading Vernier A		Reading Vernier B		Mean Vernier A	Mean Vernier B	Mean Face angle
			Initial	Final	Initial	Final			

PRACTICAL NO: 7

Objective: - To measure vertical angle between two points using theodolite.

Apparatus: Transit theodolite Tripod, ranging rod, pegs etc.

Procedure: To measure the vertical angle of an object P

1. Set up the instrument over station O and level it carefully with respect to altitude bubble.
2. By means of vertical circle clamp and tangent screw, set 0 of the vertical circle exactly to 0 of the circle.
3. Bring the bubble of the altitude level to the centre of its run by means of foot &clip screw.
4. The line of sight is thus made horizontal.
5. Loose the vertical circle clamp and direct the telescope in vertical plane towards the object P, and bisect exactly using vertical tangent screw.
6. Read both the vernier C and D, the mean of two readings gives angle for that face.
7. Change the face and repeat the above process, and get the face reading.
8. The average of two face values gives exact value of required vertical angle
   .
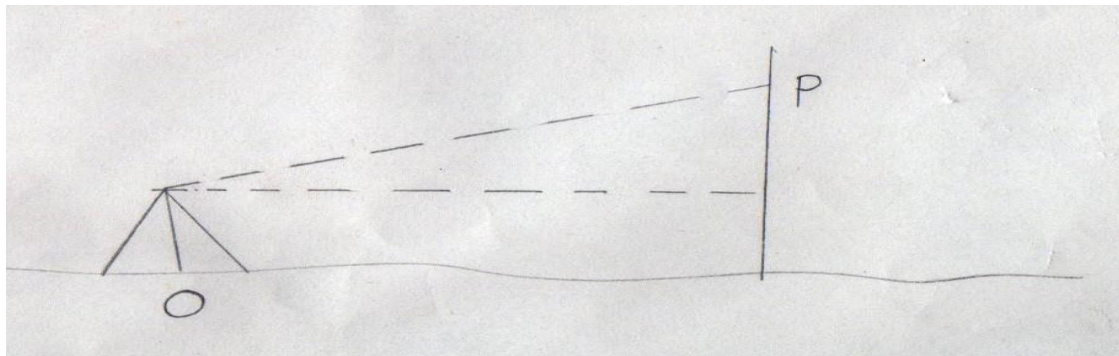
Observation Table:

| Station	Object	Face	Reading Vernier A		Reading Vernier B		Mean Vernier A	Mean Vernier B	Mean Face angle
			Initial	Final	Initial	Final			

Result:

Experiment No 8

Objective: Setting out of simple circular curve by Rankine method of tangential angle.
Apparatus: Theodolite, ranging rods, pegs, arrows etc.
Theory: A deflection angle to any point on the curve is the angle at P.C between the back tangent and the chord from the P C to that point.
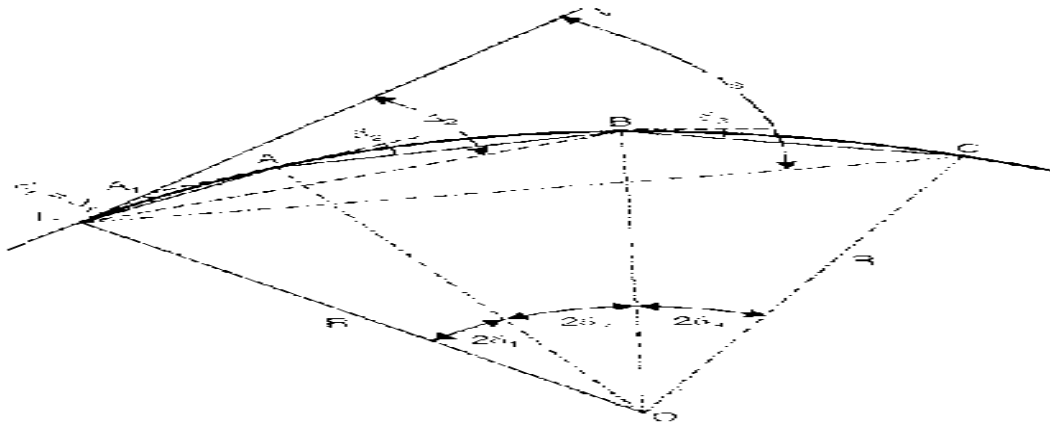
Theory:
T1V= rear tangent
T1 = Point to curve
    = the tangential angles or the angles with each of the successive chords

T1A, AB, BC etc. Makes with the respective tangents to the curve at T1, A, B etc
    = Total tangential angles of the deflection angles to the points A , B, C etc.

C1, C2, C3 = lengths f the chords T1A, AB, BC etc...

A1A = tangent to the curve at A
    = 1719 C /R minutes

For the first chord
    = tangential angle for the chord AB

Hence, the deflection angle for any chord is equal to the deflection angle for the previous chord plus the tangential angle for that chord.

Procedure:
1. Set the theodolite at the point of curve T1.
2. With both the plates clamped to zero, direct the theodolite to bisect the point of intersection V. The line of sight is thus in the direction of the rear tangent.
3. Release the vernier plate and set angle 1 on the vernier .The line of sight is thus directed along chord T1A.
4. With zero end of tape pointed at T1 and arrow held at a distance T1A = c along it, swing the tape around T1 till the arrow is bisected by the cross hairs.

5. Thus the first point A is fixed.

6. Set the second deflection angle 2 on the vernier so that the line of sight is directed along T1B.

7. with the zero end of the tape pinned at A, and an arrow held at distance AB = C along it, swing the tape around A till the arrow is bisected by the cross hairs, thus fixing the point B.

8. Repeat steps 4 and 5 till last point is reached.

Result: The simple curve was set by Rankine's method of tangential angle.