A REPORT
ON
SURVEYING PRACTICAL

SURVEYING-I (CE-504)

Submitted By:

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Pulchowk Campus

Pulchowk , Lalitpur

Submitted To:

Survey Instruction Committee

Department Of Civil Engineering

Pulchowk Campus

Pulchowk , Lalitpur

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
PULCHOWK CAMPUS

A LAB REPORT
ON
PACE FACTOR CALCULATION AND LINEAR DISTANCE MEASUREMENT

178
2/17

Lab No.: 1
Experiments Date: 2080/02/10
Submission Date: 2080/02/17

SUBMITTED BY:
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Group: 'H'
Roll No.: 078BCE178

SUBMITTED TO:
Department of
Civil Engineering

TITLE: LINEAR DISTACE MEASUREMENT

OBJECTIVES

(I) To determine the Pacing factor.
(II) To determine horizontal distanu of plane ground by taping.
(III) To calculate Poecision and Discrepancy.
(IV) To become familier with various instruments.

INSTRUMENTS AND ACCESIORIES USED:-

- Measuring tape (fiber) 30m - 1
- Steel Measuring tape 3m - 1
- Ranging Rods - 4
- Plumb Bob - 1
- Marking Arrows - 4
- Wooden Pegs - 2
- Hammer - 1

THEORY

Ranging a line:

To measure the linear distance we use a measuring Tape. When the length of measuring tape become insufficient to measure the distance then in this situation we break the total distance into number of intermediate points on the straight line. The total distance can be obtained by adding the distance between the intermediate points.

Pace Factor:

Pace Factor is the distance covered by a person in one step. The term pacing means measuring distance in the field by counting steps (paces).

This method is preliminary method of linear measurement. To determine linear distance by pacing, it is done by walking in natural step and continuing the walking by counting the number of steps upto the final points.

The pace factor is determined by relation:-

$$\text{Pace factor (m/pace)} = \frac{\text{Known distance (taped distance)}}{\text{Average number of pace}}$$

Thus,

$$\text{Distance} = \text{Pace factor} \times \text{Number of paces.}$$

Discrepency:

Discripency means deviation in two measured quantity. It is used for repetitive value of same measurement.

$$\text{Discrepency (e)} = \text{Forward Measurement (FW)} - \text{Backward Measurement (BW)}$$

Precision:

It is closeness of one measurement to another. Precision is degree of perfection used in instruments, methods and observation.

In distance measurement,

$$\text{Precision} = \frac{\text{Error of measurements (e)}}{\text{Distance measured (Avg.)}} = \frac{1}{\frac{\text{Avg.}}{\text{error}}}$$

$$\text{Avg} = \frac{FW + BW}{2}$$

For fairly leveled Ground, precision better than $\frac{1}{2000}$ (or 1:2000 or 1 in 2000) is desired.

PROCEDURE:-

FOR DETERMINATION OF PACE FACTOR

(1) Initially, 40m length on ground was measured and at both ends two ranging rods were fixed.

(2) Start walking between two ranging rod with normal pace three-times in forward, backward and forward direction by counting number of steps for each direction.

(3) Average number of paces was calculated.

(4) The pace factor was determined by dividing total distance by average number of steps.

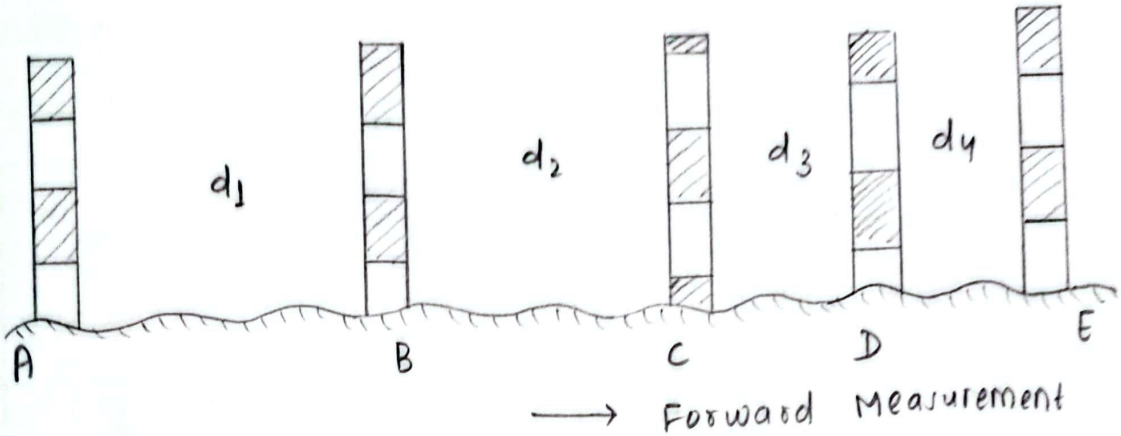
FOR LINEAR MEASUREMENT ON FAIRLY LEVELLED GROUND:

(1) For linear measurement of plain ground, two points for linear measurements were determined (random distance: maybe determined by pacing), at that place two pegs are fixed. Two ranging rods were set behind pegs and ~~were~~ made vertical with the help of plumb bob.

(2) Now, total linear distance was divided into four parts. For that, the third ranging rod was set randomly between two ranging rods such that all three rods were made in same straight line. A marking rod was set where third ranging rod was placed. Again, similar process was continued to two other positions with held of ranging rod and marking rods were set.

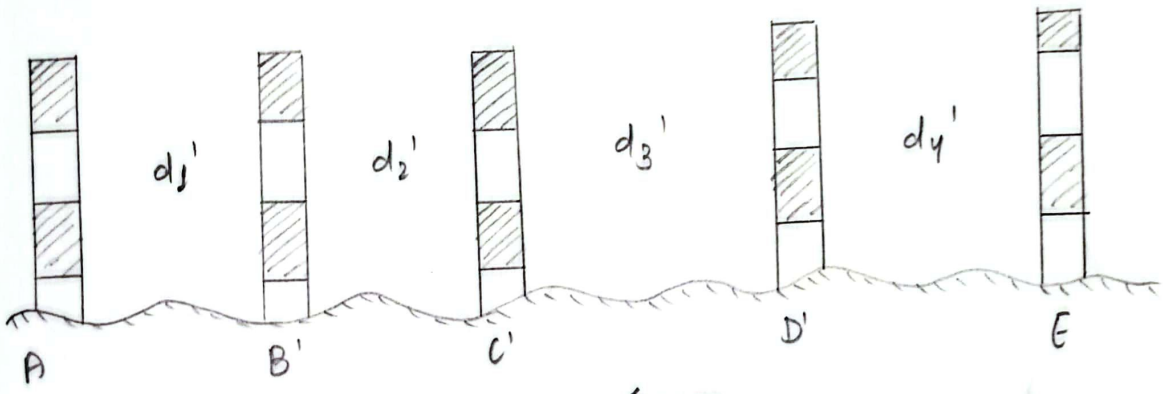
(3) Next, linear distance of each part was measured in forward direction and noted.

(4) Again, same as step (2), marking rods were set in other positions to divide total length



⟶ Forward Measurement

$d = d_1 + d_2 + d_3 + d_4$



⟵ Backward Measurement

$d' = d_1' + d_2' + d_3' + d_4'$

Fig: Linear Measurement of Plane Ground.

to four parts.

(5) Finally, measurement of each part was done in backward direction and noted.

OBSERVATION:

For Pace Factor:-

S.N.	Distance	Number of steps	Average	Pace Factor
1	40m	45	46	$\frac{40}{46} = 0.870$ m
2	40m	47		
3	40m	46		

Distance measurement of Fairly levelled ground by Taping:-

Line/Leg		Distance (m)				Average Distance(m) (3+4)/2	Discrepancy(c) = 3-4	Precision $\frac{6}{5} \geq 1$ in 2000	Remarks
From	TO	Forward(FW)	Total FW	Backward(BW)	Total BW				
1	2		3		4	5	6	7	
A	B	29.772							
B	C	20.198	89.838						
C	D	19.382							
D	E	20.486				89.819	0.038	1:2364	
E	D'			27.322					
D'	C'			14.704	89.800				
C'	B'			18.216					
B'	A			29.558					

RESULT :-

From this field, the length of plane ground is found ~~8705~~ 89.819m. The ~~horizontal~~ pace factor was found to be 0.870m.

CONCLUSION :-

From this practical, we learned to range a line using ranging rods, measure the length of plane ground, to measure pace factor. We knew about different types of errors that may occurs during the field work and ways to minimize those errors.

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
PULCHOWK CAMPUS

A LAB REPORT
ON

Horizontal distance measurement of sloping ground by direct and indirect methods

178
2/24

Lab No.: 02
Experiments Date: 2080-02-17
Submission Date: 2080-02-24

SUBMITTED BY:
Name: Surendra Sharma
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SUBMITTED TO:
Department of
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PRACTICAL TASK

Linear Measurement

OBJECTIVES

→ TO determine horizontal and vertical distance on sloping ground by direct and indirect method.

INSTRUMENT AND ACCESSORIES USED:

- Measuring tape 30m-1
- steel measuring tape 3m-1
- Abney level - 1
- Ranging rods - 3
- Plumb bob - 1
- Marking Arrows - 4
- Hammer - 1
- Wooden pegs - 2

THEORY

The horizontal distance of sloping ground can be measured in two ways:

(1) Direct method:

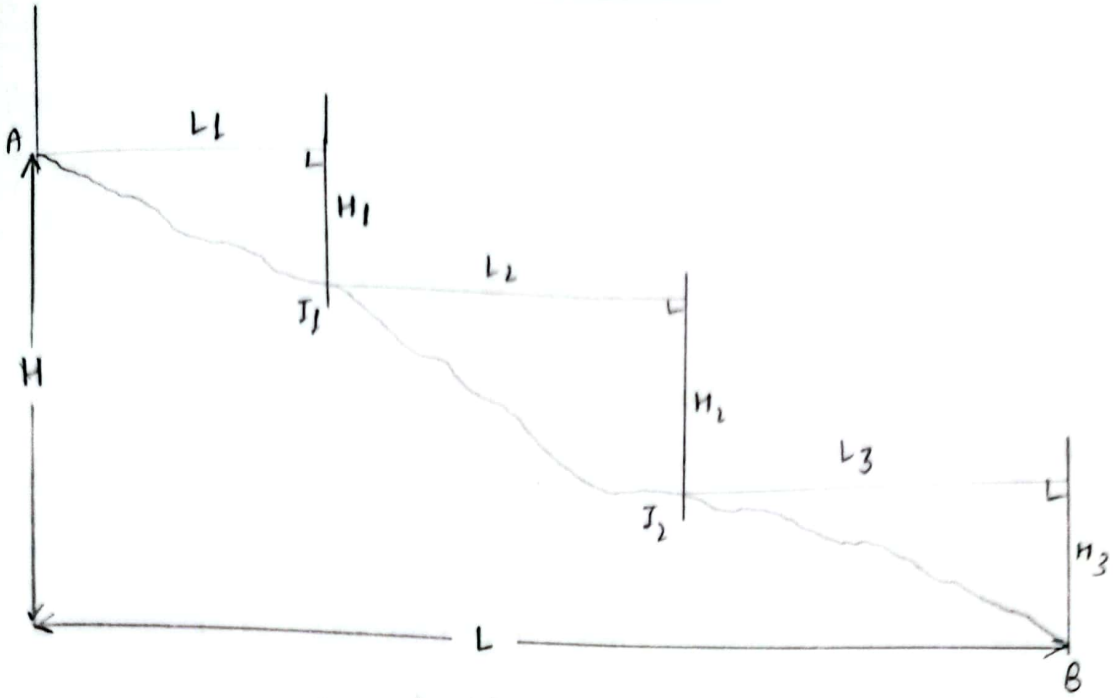
In this method, the slope is ranged with ranging rods and the horizontal distance is directly measured by using measuring tape. This method is also called stepping method. In this method, the tape is kept horizontal either by eye judgement or by using hand level.

(2) Indirect method:

In this method, firstly the angle made by slope with horizontal is measured using Abney level. The slope distance is measured with measuring tape. Then, horizontal distance is measured by using relation.

$$\text{Horizontal distance} = \text{slope distance} \times \cos\theta$$

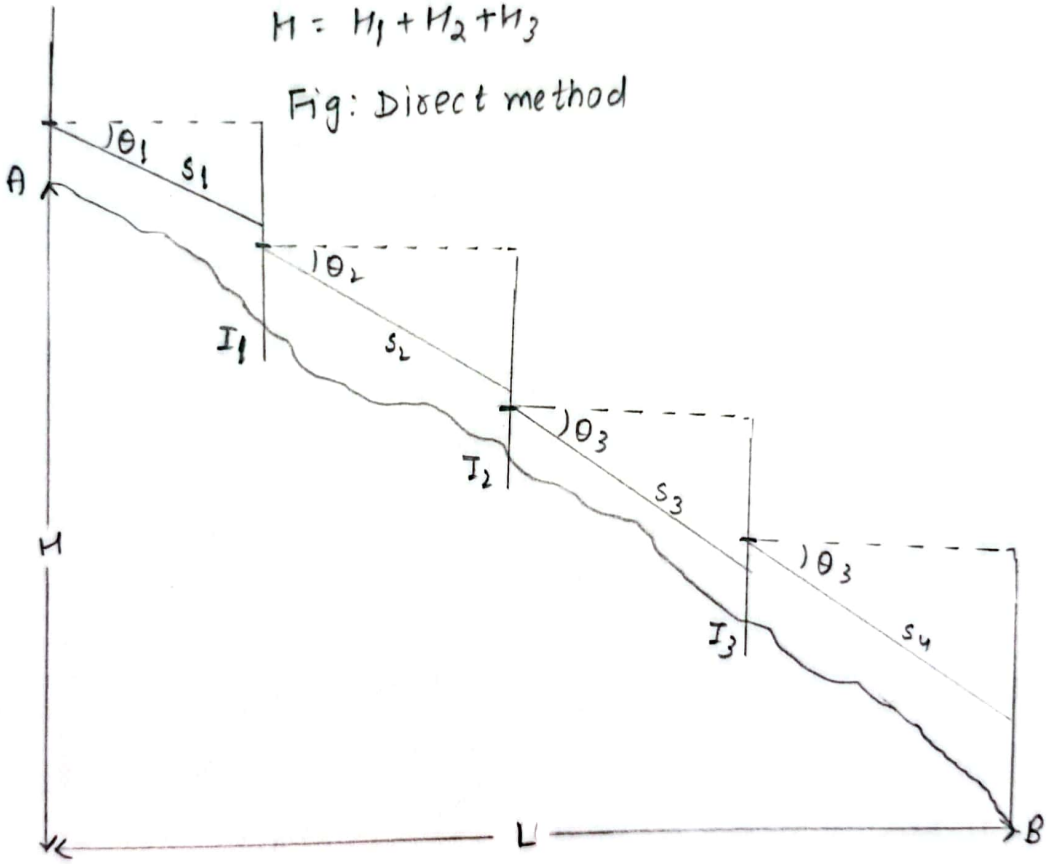
where, θ is angle measured by Abney level.



$L = L_1 + L_2 + L_3$

$H = H_1 + H_2 + H_3$

Fig: Direct method



$L = \Sigma S \cos\theta$

$L = S_1 \cos\theta_1 + S_2 \cos\theta_2 + S_3 \cos\theta_3 + S_4 \cos\theta_4$

Fig: Indirect Method.

PROCEDURE :-

For measurement of sloping ground:

. Direct method or stepping

→ At first, two points are determined for measurement of sloping ground, and pegs are fixed at that place

→ The ranging rods are fixed behind the pegs and they are made vertical with the help of plumb bob.

→ The total distance between two pegs is broken in such a way that each part are at same slope. Third ranging rod is placed at the end of each part vertically and all three rods are made in same straight line.

→ The horizontal distance between two ranging rods are measured directly by measuring tape.

→ Finally, the same process is repeated in backward direction also.

. Indirect method by Abney level

→ At first two points for measurement of sloping ground are determined. Two pegs are fixed at that place and two ranging rods are fixed behind pegs and made vertical with plumb bob.

→ The sloping distance between two points is measured by using measuring tape and horizontal angle is measured by abney level, and the horizontal distance is measured by using,

Horizontal distance = Sloping distance $\times \cos\theta$

CALCULATION/MEASUREMENT:

Distance measured by taping on sloping ground

Direct method:

Line		Distance (m)					Discrepancy (e)	Precision $\frac{1}{D/e}$
From	TO	Forward	Total (D_1)	Backward	Total (D_2)	D		
A	I_1	6.344		7.806				
I_1	I_2	6.426	18.314	6.796	18.332	18.323	0.018	$\frac{1}{1018}$
I_2	B	5.544		3.730				

Indirect method:-

Line		Forward Reading(m)			Backward Reading(m)			Avg	Discrepancy (e)	Precision
From	TO	S	θ	L = S cos θ	S	θ	L = S cos θ			
A	I_1	6.980	4°10'	6.962	7.944	4°20'	7.921			
I_1	I_2	9.944	4°10'	9.918	8.920	3°30'	8.903	31.142	0.055	$\frac{1}{566}$
I_2	I_3	8.078	3°50'	8.060	7.402	4°40'	8.033			
I_3	A	6.252	4°40'	6.231	6.934	4°20'	6.914			

RESULT:

From this field work, the horizontal length of sloping ground was found to be 18.332 m by direct method and 31.142 m by indirect methods. We also learnt

CONCLUSION:

From this practical, we learned the use of ranging rods in measuring horizontal distance of sloping ground by direct and indirect methods. We also learnt the use of abney level to determine horizontal level. Here, we learnt about various errors that may occur during field work and ways to minimize them.

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A LAB REPORT
ON

COMPASS TRAVERSE AND CHAIN SURVEY [WORKSHOP]

Lab No.: 03
Experiments Date: 2080-02-24 | 2080-02-31
Submission Date: 2080-05-01

SUBMITTED BY:
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B. H No.: 078BCE178

SUBMITTED TO:
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TITLE : COMPASS TRAVERSE AND CHAIN SURVEY

OBJECTIVE:

(i) TO be familier with bearing measurement by prismatic compass for compass survey.
(ii) TO get concept of making closed traverse for longer areas.
(iii) TO find out the local attraction station and elimination of it by bearing measurement
(iv) TO plot the traverse in drawing sheet and adjusting closing error.
(v) TO be able to find location of object using offset method.
(vi) TO know the rules for detailing and able to draw detailed drawing.

Instruments and Accessories used:

(i) prismatic compass - 1
(ii) Measuring tape (30m) - 2
(iii) Ranging rod - 3
(iv) Metallic chain (5 m) - 1
(v) Plumb bob - 1
(vi) Hammer - 1
(vii) Arrows - 3
(viii) Wooden pegs - 7

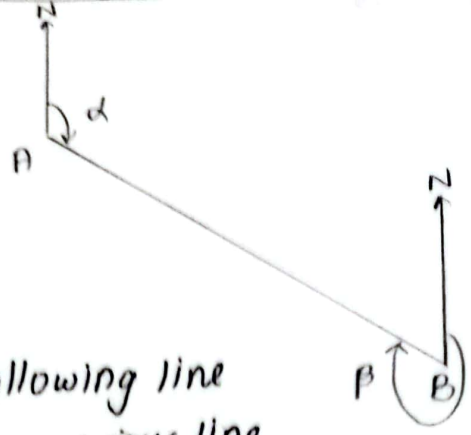
THEORY

Compass survey: It is the branch of surveying in which both linear measurement and angular measurement is done. Linear measurement done using tape/chain while angular measurement done using compass.

Fore Bearing: The bearing of line measured in (FB) forward direction.

Back bearing: The bearing of line in backward direction.

FB of AB = α
BB of AB = β



In NCB system,

$FB - BB = \pm 180°$

For anticlockwise traverse

Internal angle = FB of following line
- BB of previous line
[If -ve, add 360°]

Demerit of compass survey:
Places where magnetic material are present, the bearing measurement is highly affected.

parts of prismatic compass:

- Magnetic needle
- Eye vane
- Eye slit
- Eye hole
- Mirror
- Glass cover
- Lifting lever
- Lifting pin
- Focusing stand
- Object vane
- Sunglasses
- Horse hair.

Bearing: The horizontal angle between meridian and survey line in clockwise or anti-clockwise direction is bearing.

Temporary adjustment of prismatic compass:

(i) Setting: compass fitted over tripod was set at a point.
(ii) Centering: compass is kept exactly over station with help of plumb bob.
(iii) Free movement of needle is ensured with the help of ball and socket arrangement on tripod.
(iv) Elimination of parallex
(v) Observation of bearing.

PROCEDURE

(i) Reconnaissance: We need to walk over the area of survey, understand the terrain, obstacles and observe for location of station such that adjacent station are intervisible and leg ratio is maintained.

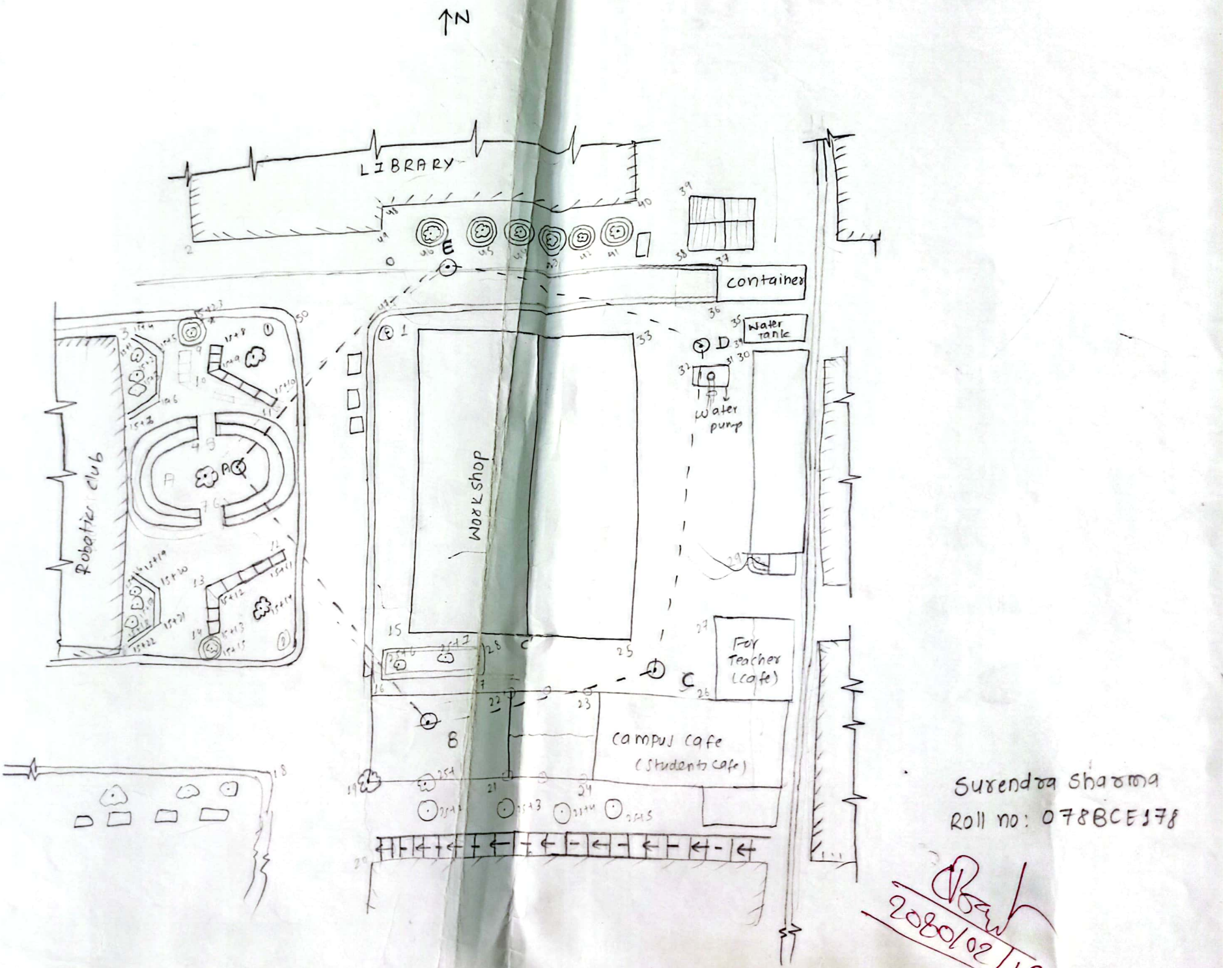
(ii) Bearing of traverse leg were determined.

(iii) Offsets for any one traverse leg was taken (oblique and perpendicular offset).

(iv) Detailing of various points, building, walls, road, chautari, garden, etc were done by setting up compass in each station and taking bearing and horizontal distance.

(v) Internal angles were calculated, bearing and internal angles were corrected.

(vi) plotting of all the details were done in paper along with indexing, misclosure calculating, site details, etc.



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	FB	BB	Difference	Length (m)
AB	166°	345°	179°	28.089 m → 14.05
BC	96° 30'	277° 30'	181°	23.568 → 11.784
CD	24° 30'	204° 30'	180°	29.159 → 14.58
DE	315°	133°	182°	25.324 → 12.67
EA	235°	55° 30'	179° 30'	29.598 → 14.8

135.738

Internal Angle Calculation

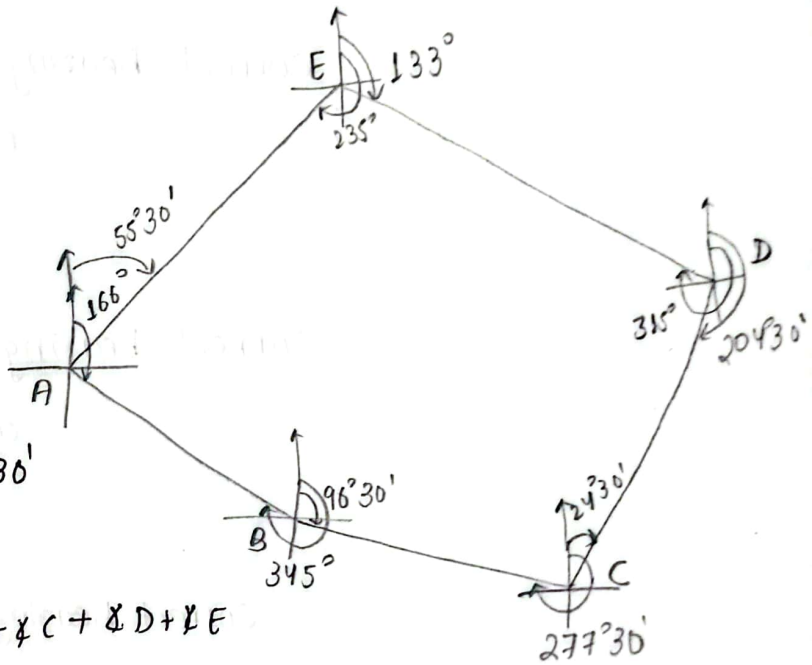
$\angle A$ = FB of AB − BB of EA
= 166° − 55° 30'
= 110° 30'

$\angle B = (96°30' - 345°) + 360°$
= 111° 30'

$\angle C = (24°30' - 277°30') + 360°$
= 107°

$\angle D = (315° - 204°30') = 110°30'$

$\angle E = (235° - 133°) = 102°$



Thus,
Observed sum = $\angle A + \angle B + \angle C + \angle D + \angle E$
= 541° 30'

Theoretical sum = $(2 \times 5 - 4) \times 90° = 540°$

error (e) = Observed sum − Theoretical sum
= 1° 30' (correction → −ve)

correction = $-\frac{1°30'}{5} = -18'$ (

Thus, corrected internal angles,

$\angle A$ = 110° 30' − 18' = 110° 12'
$\angle B$ = 111° 30' − 18' = 111° 12'
$\angle C$ = 107° − 18' = 106° 42'
$\angle D$ = 110' 30' − 18' = 110° 12'
$\angle E$ = 102° − 18' = 101° 42'
540°

Bearing correction,

CD line has correct bearing since difference of FB is 180°.

Thus,

correct bearing of CD = $24°30' + \frac{0°}{2} = 24°30'$

corrected ∠D: $+ \underline{111°12'}$

$134°42'$ (<180)

$+ \underline{180°}$

correct bearing of DE: $314°42'$

corrected ∠E: $+ \underline{101°42'}$

$416°24'$ (>180)

$- \underline{180°}$

correct bearing of EA: $236°24'$

corrected ∠A: $\underline{110°12'}$

$346°36'$ (>180)

$- \underline{180°}$

correct bearing of AB: $166°36'$

corrected ∠B: $+ \underline{111°12'}$

$277°48'$ (>180)

$- \underline{180°}$

correct bearing of BC: $97°48'$

corrected ∠C: $\underline{106°42'}$

$204°30'$ (>180)

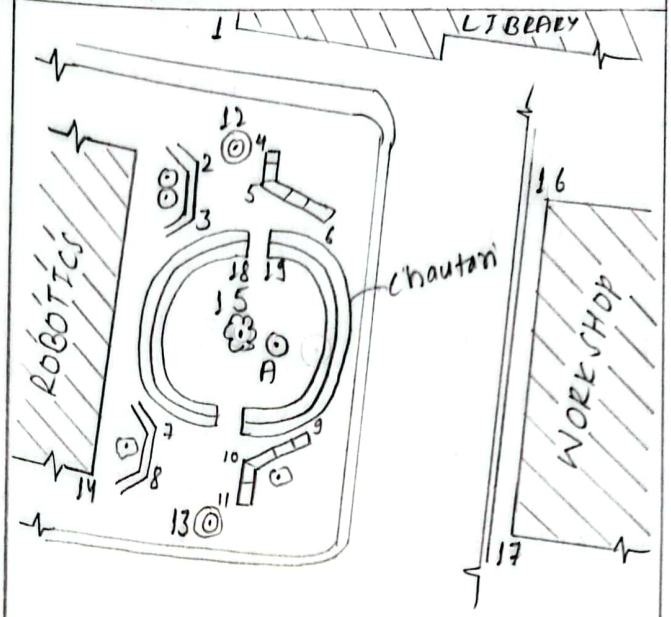
$- \underline{180°}$

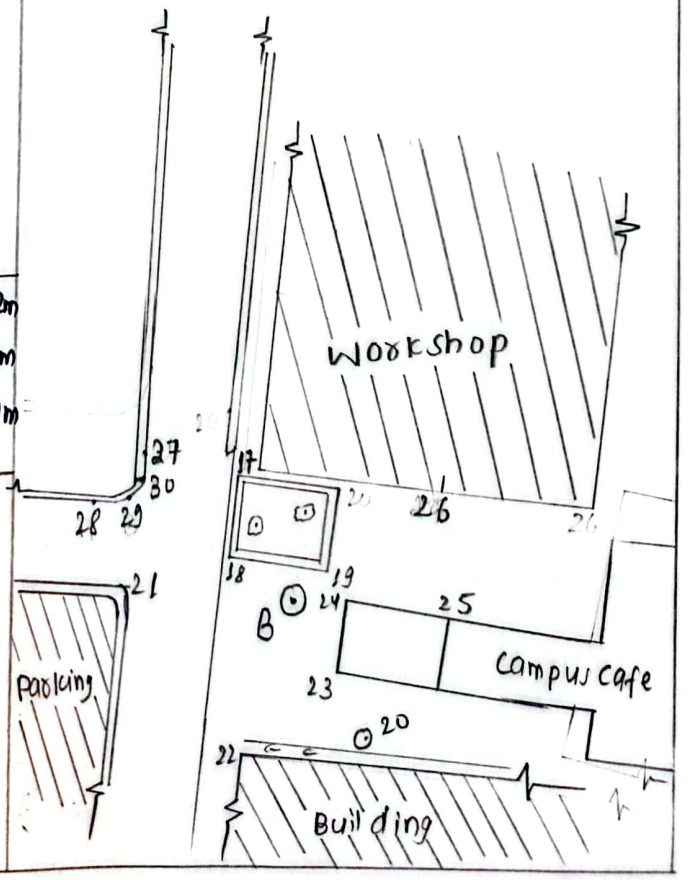
correct bearing of CD: $24°30'$ (checked)

Details on stations

Station	Sighted to	Length (m)	Bearing
A	1	28.500	358°30'
	2	10.826	04°00'
	3	7.646	358°00'
	4	13.900	11°00'
	5	7.274	11°30'
	6	4.570	60°30'
	7	8.300	216°30'
	8	11.742	210°30'
	9	4.758	149°00'
	10	7.944	223°00'
	11	14.318	223°30'
	12	15.500	18°30'
	13	17.918	198°00'
	14	17.464	225°30'
	15	2.000	282°00'
	16	19.204	55°30'
	17	19.660	162°30'
	Chautari: Inner Radius = 3.712m Middle Radius = 4.140m Outer Radius = 4.520m		
B	17	8.618	352°30'
	18	5.310	315°00'
	19	2.984	44°00'
	20	6.434	181°30'
	21	11.950	273°30'
	22	7.312	214°

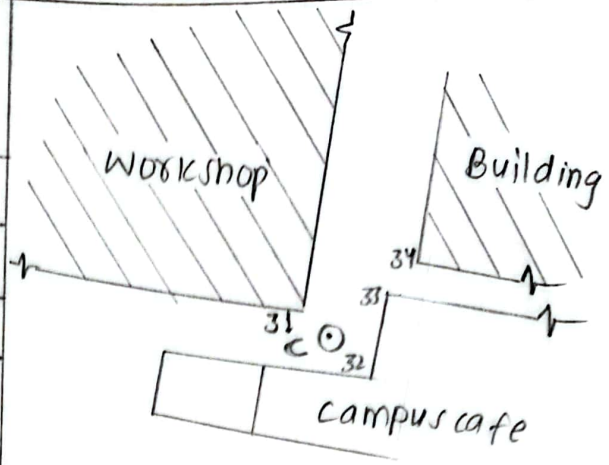
Sketch

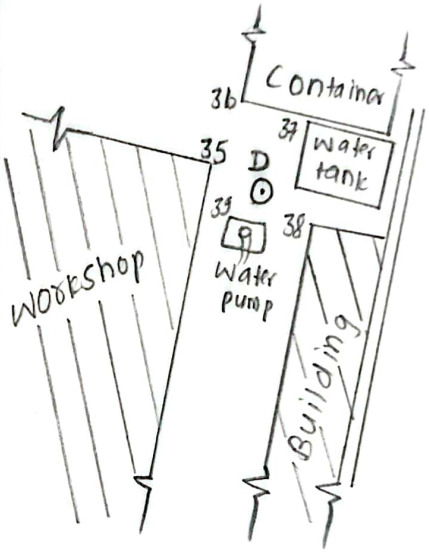




Station	Sighted to	Length (m)	Bearing
B	23	6.744	125°30'
	24	6.700	93°30'
	24–25 : length = 8.006m		
	26	11.750	73°30'
	Curved Road		
	27	14.664	315°00'
	28	14.184	303°30'
	29	12.710	315°00'
	30	12.784	322°00'
	Road width → 4.768m Drain width → 0.631 m		
C	31	3.322	348°00'
	32	4.458	163°00'
	33	4.800	51°30'
	34	8.728	43°30'
D	35	3.622	303°30'
	36	5.018	346°00'
	37	1.560	57°00'
	38	5.908	182°00'
	39	2.722	224°00'
	Container : length = 6.396m breadth = 2.416m Water tank : length = 3.526m breadth = 2.282m Building : breadth = 4.548m Water pump (square) : length = 1.494m		

sketch

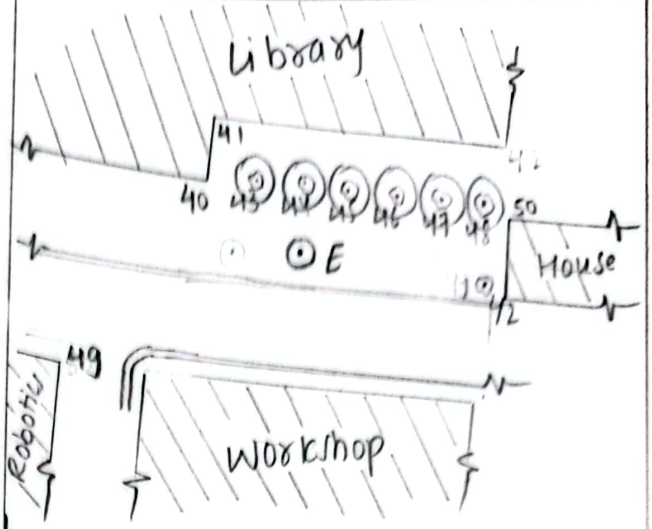


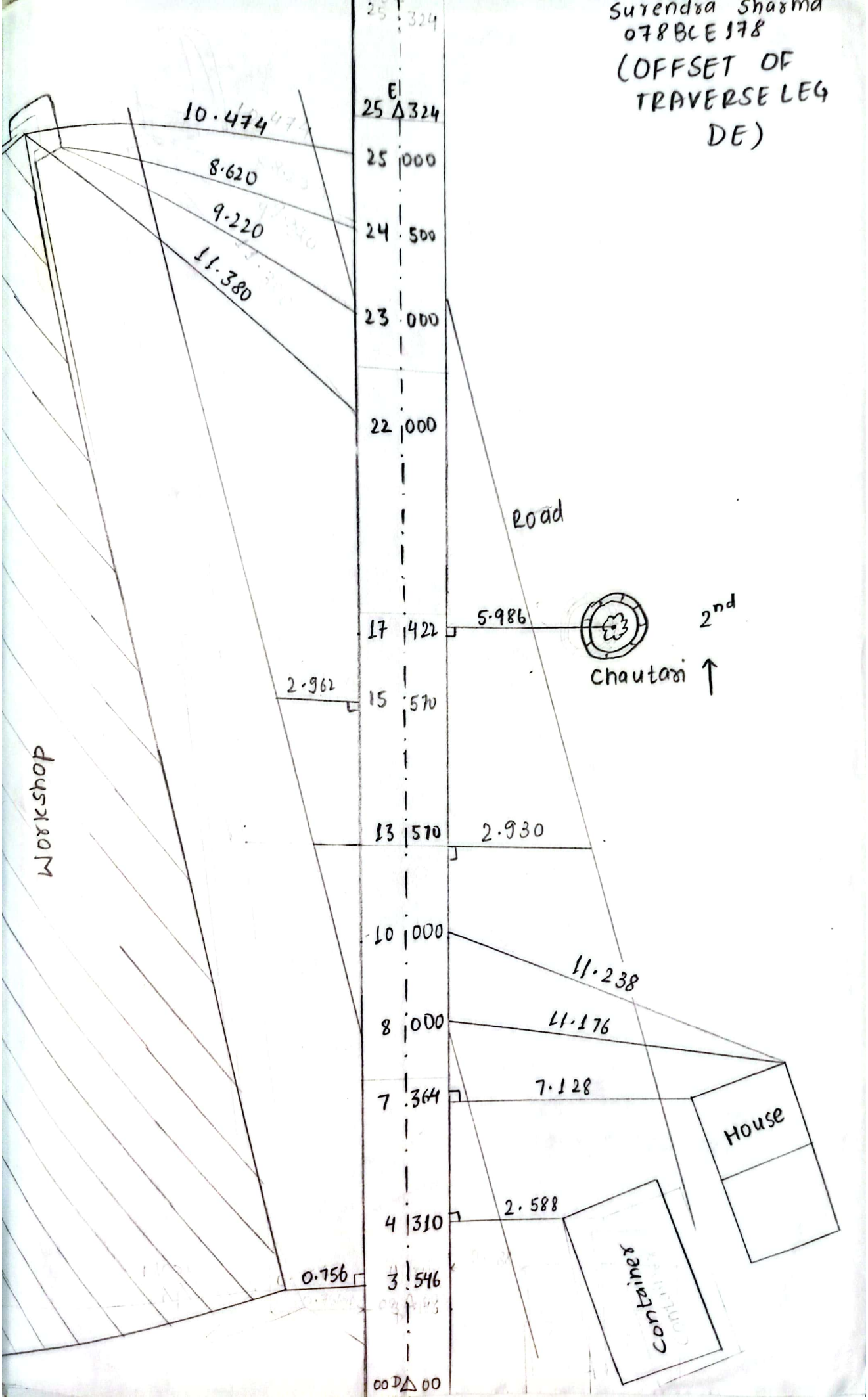


Station	Sighted to	Length	Bearing
E	40	8.126	306°30'
	41	10.402	329°30'
	42	20.326	107°30'
	43	5.760	320°00'
	44	3.126	353°00'
	45	3.948	62°00'
	46	6.686	80°30''
	47	9.824	90°00'
	48	13.372	93°00'
	49	27.456	267°00'
	50	20.326	95°00'

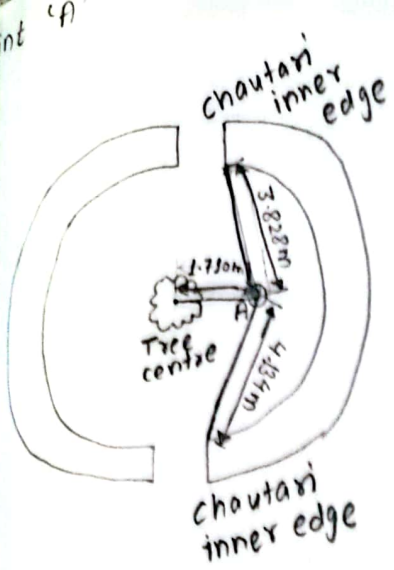
Workshop:
length = 30.904m
Breadth = 24.908m
Road width = 5.560m
Chautari Radius
= 3.422m

sketch.

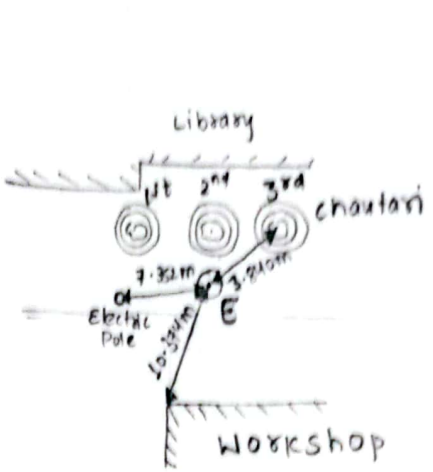



Surendra Sharma
078BCE178
(OFFSET OF TRAVERSE LEG DE)
E
25 Δ 324
25 000
24 500
23 000
22 000
17 422
15 570
13 570
10 000
8 000
7 364
4 310
3 546
00 D Δ 00
10.474
8.620
9.220
11.380
Road
5.986
2nd
Chautari
2.962
2.930
11.238
11.176
7.128
House
2.588
Container
0.756
Workshop

oint 'A'



Point 'E'



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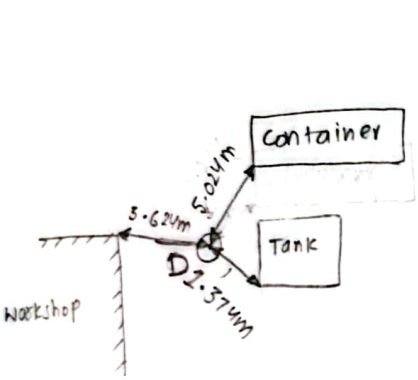
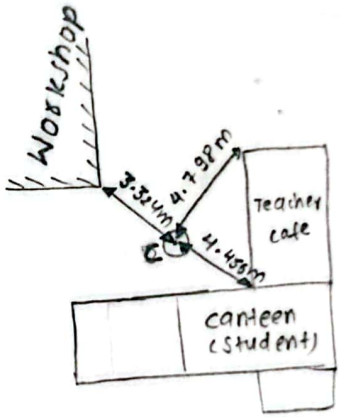
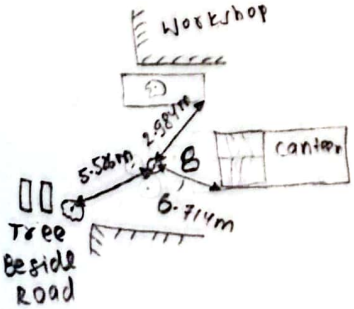


Point 'C'



oint 'B'

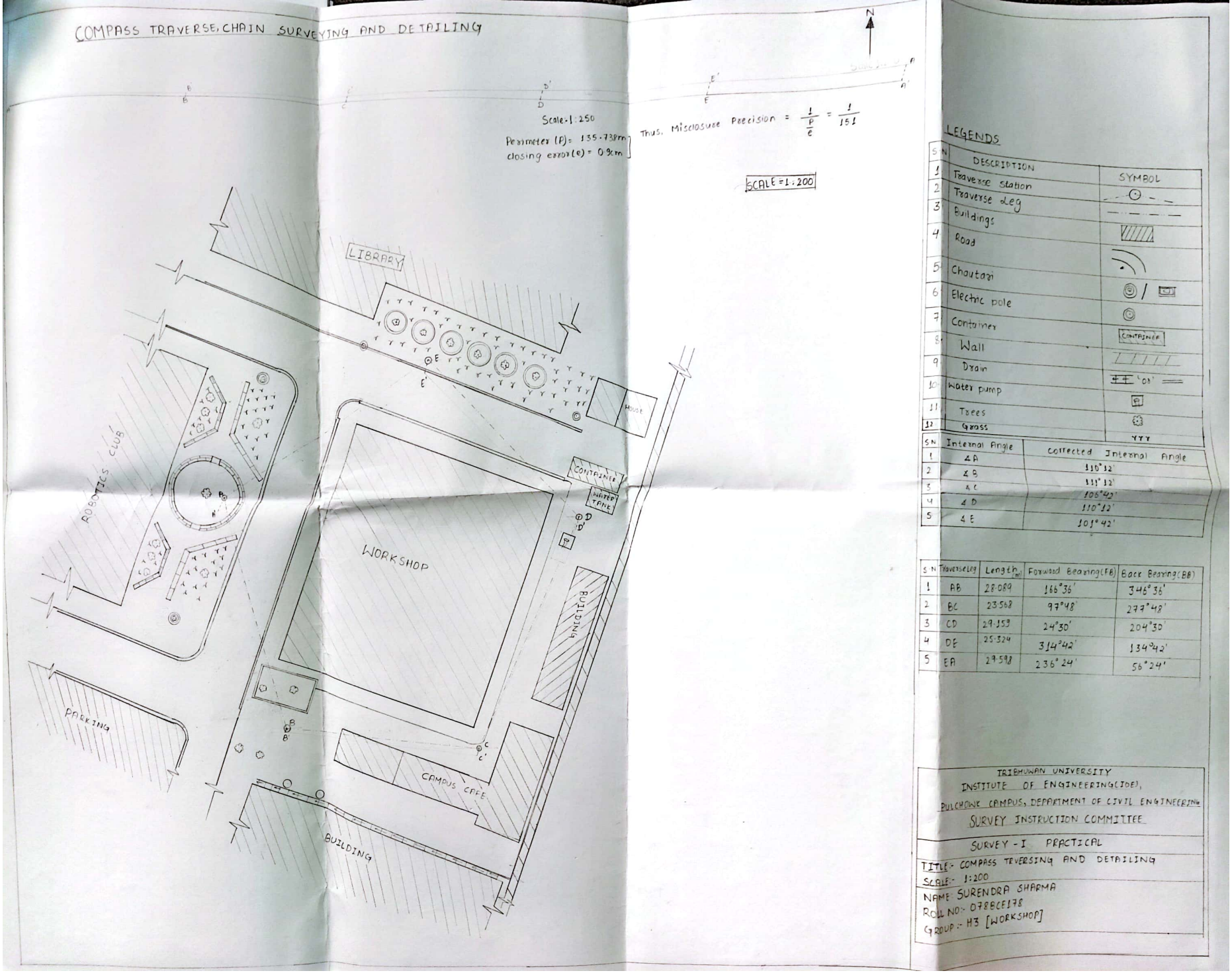


Referencing

Group - 'H3'

078BCE178
Surendra Sharma.

COMPASS TRAVERSE, CHAIN SURVEYING AND DETAILING



LEGENDS

S.N	DESCRIPTION	SYMBOL
1	Traverse station	
2	Traverse leg	
3	Buildings	
4	Road	
5	Chautari	
6	Electric pole	
7	Container	CONTAINER
8	Wall	
9	Drain	
10	Water pump	
11	Trees	
12	Grass	YYY

S.N	Internal Angle	Corrected Internal Angle
1	∠A	110°12'
2	∠B	111°12'
3	∠C	105°42'
4	∠D	110°12'
5	∠E	101°42'

S.N	Traverse Leg	Length (m)	Forward Bearing (FB)	Back Bearing (BB)
1	AB	28.089	166°36'	346°36'
2	BC	23.568	97°48'	277°48'
3	CD	29.153	24°30'	204°30'
4	DE	25.324	314°42'	134°42'
5	EA	29.598	236°24'	56°24'

TRIBHUWAN UNIVERSITY
INSTITUTE OF ENGINEERING(IOE),
PULCHOWK CAMPUS, DEPARTMENT OF CIVIL ENGINEERING
SURVEY INSTRUCTION COMMITTEE

SURVEY - I PRACTICAL

TITLE:- COMPASS TRAVERSING AND DETAILING
SCALE:- 1:200
NAME: SURENDRA SHARMA
ROLL NO:- 078BCE178
GROUP:- H3 [WORKSHOP]

TRIBHUVAN UNIVERSITY
Institute of Engineering,
Pulchowk Campus

A LAB REPORT

ON

TWO PEG TEST/ COLLIMATION TEST

LAB NO: 4

EXPERIMENTS DATE: 2080-03-06

SUBMITTED DATE: 2080-03-13

178/3/13

SUBMITTED BY:

Name: Surendra Sharma
Group: 'H' (H_3)
Roll No: 078BCE178

SUBMITTED TO:

Department of
Civil Engineering

TITLE: LEVELLING (Two Peg Test)

OBJECTIVE:

(i) To be Familier with the terms and instruments which are used in levelling.

(ii) To get knowledge about handling, temporary adjustment and two peg test for collimation check of instrument.

INSTRUMENTS AND ACCESSORIES

(i) Auto level with Tripod
(ii) Levelling staff
(iii) Measuring tape
(iv) Wooden pegs
(v) Marking arrows
(vi) Ranging rods
(vii) Hammer
(viii) Foot plate

THEORY

Levelling is the art of determination of relative altitudes of point on the surface of the earth or beneath the surface. Levelling deals with measurement of vertical plane.

PRINCIPLE OF LEVELLING

The principle of levelling is to maintain the horizontal line of sight and fixing vertical distance of the plots above or below the line of sight.

Benchmark (BM):

It is the permanently accessible point of known height above a datum to which the height of other point can be refered

Stations:

Point where the levelling staff is held for taking observations. It is the point where elevation is to be determined.

Turning point (TP):

The point which connects one set of reading to another set is turning point. Both foresight and backsight are taken in turning point.

Level surface:
A level surface is defined as the curved surface obtained by passing the spherical surfaces through the points with centre as the centre of gravity of Earth. Also any surface parallel to mean spheroidal surface of earth is level surface.

Level line:
Any line drawn on level surface connecting any two points on it. It is normal to direction of gravity.

Horizontal surface:
A surface tangential to level surface.

Datum:
Imaginary surface from which all elevation are referred. Normally, mean sea level is datum worldwide.

Line of sight
Line passing through the optical centre of objective traversing the eye piece and entering the eyes

Reduced level:
It is the height of line of sight or collimation from datum.

Height of Instrument:
Height of line of sight or collimation from datum.

Line of collimation:
It is the imaginary line joining the optical centre of objective with the intersection of cross hair & its continuation.

Levelling instrumen:
Instrument used for levelling. It mainly consists of
(a) Telescope: Used to produce line of sight.
(b) Level tube: Used to make line of sight horizontal.

Simple Levelling:
Operation of levelling for determination of difference in elevation in between two points visible from a single section of level is simple levelling.

Backsight (BS)
It is the first reading taken at a station of known elevation after setting up the instrument. This reading gives height of instrument (elevation of line of collimation). It is also called plus sight.

HI = know elevation + Backsight

Foresight (FS)
It is the reading taken on the staff either held at last point whosed elevation is required or held at the turning point just before shifting the instrument.

Adjustment of level:

(i) Temporary adjustments: Adjustment made for every setting of level - It includes
  (i) Setting the level
  (ii) Elimination of parallax.

(ii) Permanent adjustments: It is the adjustment when various part of instrument gets disturbed from their two position relative to each other. It ensure that line of collimation is horizontal when instrument has been levelled.

Two peg test:
If the line of collimation and line of sight dont coincide then there is a certain error, the error is known as collimation error. Two peg test is done to know whether the instrument is free from collimation error or not.

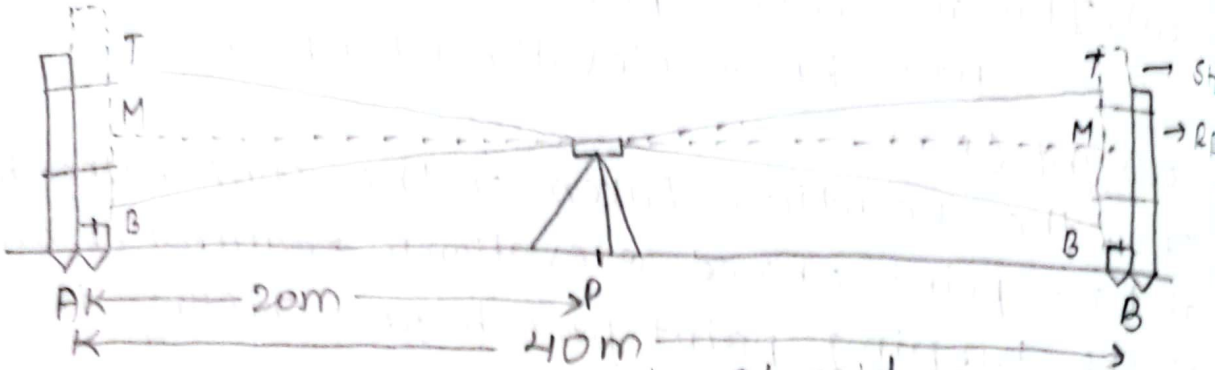


Fig: When instrument is at midway

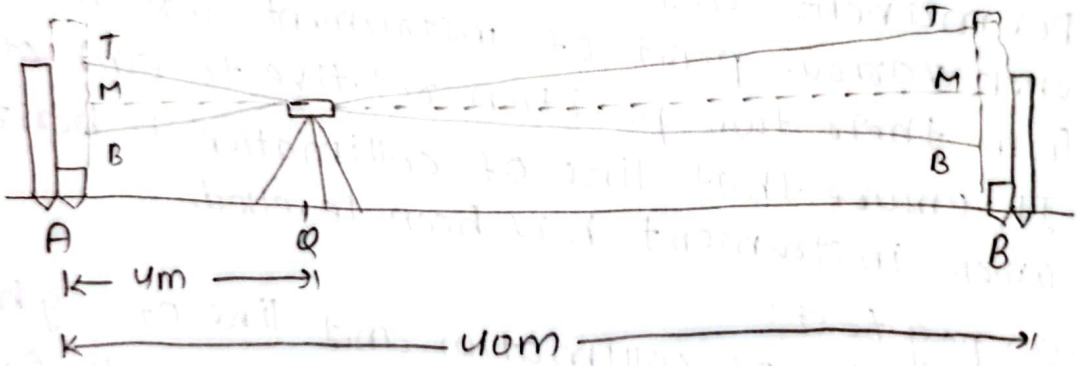


Fig: When instrument is near one end.

Tribhuvan University/Institute of Engineering
Central Campus, Pulchowk, Lalitpur
Department of Civil Engineering/Survey Instruction Committee

Group No. M3
Observer
Recorder
Instrument/Code No. :

Two Peg or Collimation Test

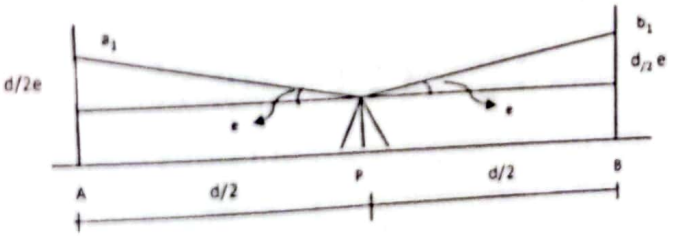
Date: 2080-03-06
Location:
Weather :
Temperature :

When instrument is at midway of two pegs (Stadia Reading)

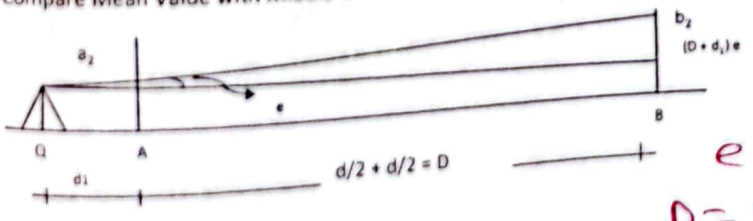
Instrument at	Sighted to	Three Wire Readings (Staff Reading) Top	Mid	Bot	Mean Value = (T+M+B) ÷ 3	True Difference h1 = (Mid A - Mid B)	Remarks
P	A	1.315	1.215	1.115	1.215	0.143	
	B	1.172	1.072	0.973	1.072		

When instrument is at near one peg (Stadia Reading)

Instrument at	Sighted to	Three Wire Readings (Staff Reading) Top	Mid	Bot	Mean Value = (T + M + B) ÷ 3	Apparent Difference h2 = (Mid A - Mid B)	Remarks
Q	A	1.168	1.148	1.128	1.148	0.146	
	B	1.181	1.002	0.823	1.002		



Note: Compare Mean Value with Middle wire reading which should be within tolerance ± 1 mm.



True difference, h1 = (a1 – b1) ..... (1)

Apparent difference, h2 = (a2 – b2) ..... (2)

Collimation error, e = |(h1 – h2) ÷ (d/2 + d/2)|

Precision = 1/D/e ≥ 1 in 10,000

Obtained Precision = 1/D/e =

Signature of Teacher at Site:

$e = |h_1 - h_2| = 0.003$

$D = 32$ (Inside)

$\text{Precision} = \frac{1}{D/e}$ (Better than $\frac{1}{10,000}$)

$= \frac{1}{\frac{32}{0.003}}$

$= 1 : 10667$

03/06

PROCEDURE

(1) Two pegs were fixed at a distance of 40m named as A and B

(2) First level was setup at the middle of two pegs with the help of plumb bob.

(3) The staffs were fixed at pegs vertically with help of ranging rod and fixed & tied with strings.

(4) Reading were taken and noted after that (T, M, B)

(5) Height difference was calculated and similar procedure were repeated by changing location of level i.e. 36m from 2nd peg.

OBSERVATION:

Set I:

When instrument is at mid point of two pegs (40m) i.e. 20m from A to B.

Instrument at	Sighted to	Staff/Stadia Reading			Mean value $\frac{(T+M+B)}{3}$	True Difference $h_1 = M_A - M_B$	Remark
		Top(T)	Middle(M)	Bot(B)			
P	A	1.315	1.215	1.115	1.215	0.143	
	B	1.172	1.072	0.973	1.072		

Set II:

When instrument is nearer to one peg (At D/10 = 4m from A)

Instrument at	Sighted to	Staff/Stadia Reading			Mean value $\frac{(T+M+B)}{2}$	Apparent Difference $h_2 = M_A - M_B$	Remark
		Top(T)	Middle(M)	Bot(B)			
Q	A	1.168	1.148	1.128	1.148	0.146	
	B	1.181	1.002	0.823	1.002		

Collimation error = $e = h_2 - h_1 = 0.146 - 0.143 = 0.003$

Diameter $D = 40 - 2 \times 4 = 32$ (Inside)

$$\text{Precision} = \frac{1}{D/e} = \frac{1}{\frac{32}{0.003}} = 1:10667$$

Result

The two peg test for 40m distance was performed on the precision obtained for given instrument is 1 : 10667. which is better than desired i.e. 1 : 10000.

DISCUSSION & CONCLUSION

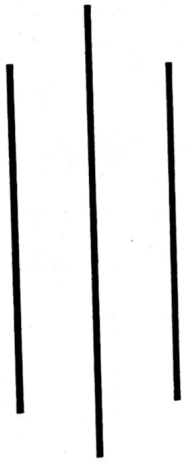
The error might have occured due to instrumental error, personal error or natural error. Collimation error can be determined or indicated in the instrument by two peg method. The height [illegible] of the point can be

TRIBHUVAN UNIVERSITY
Institute of Engineering,
Pulchowk Campus

A LAB REPORT

ON

FLY LEVELLING



1760/3/27

LAB NO: 05

EXPERIMENTS DATE: 2080-03-13

SUBMITTED DATE: 2080-03-27

SUBMITTED BY:

Name: Surendra Sharma
Group: H (H3)
Roll No: 078BCE178

SUBMITTED TO:

Department of
Civil Engineering

TITLE: FLY LEVELLING

OBJECTIVES

(i) To find the elevation difference between the given standard benchmarks.

(ii) To find the reduced level (RL) of various stations using RL of TBM 1.

INSTRUMETS REQUIRED:

(i) Level
(ii) Tripod
(iii) Staffs
(iv) Footplate

THEORY:

Fly levelling: When differential levelling is done in order to connect a bench mark to the starting point of the alignment of any project, it is called fly levelling. This process involves reading of backsight and foresight only. It is also known as transfer level.

We can calculate RL of any point using two methods:

(i) HI method.

(ii) Rise and Fall method

(i) HI method: In this method, height of instrument is calculated for each setting of the instrument by adding the backsight to the elevation of BM i.e.

HI = Elevation of BM + BS

RL of first station, i.e. RL = HI − FS

For next setup of instrument,

Height of instrument, HI = RL of 1st station + BS

RL of last point, RL = HI of last setting − FS

(ii) Rise and Fall method:

In this method, the difference of level between two consequitive points for each setting is obtained by comparing their staff reading. The difference between indicates a rise if the back sight reading is more than foresight and fall if it is less than foresight. The Rise and fall worked out for all the points give vertical distance of each point relative to the preceeding one. If the RL of back staff point (say TBM 1) is

known, then RL of following point may be obtained by adding its rise or subtracting its fall from the RL of preceeding points as the case may be:

RL of preceeding point = RL of previous point + Rise
= RL of previous point − Fall.

PROCEDURE

(i) Recci of two given benchmarks was done.
(ii) First turning point was fixed and footplate was kept.
(iii) After setting the instrument by pacing, telescope was focused at TBM1 and three wire readings taken for TBM1.
(iv) Mean of three readings was compared to middle wire reading. If difference was more than 3mm, reading was taken again.
(v) Then level was focused on staff at TP1 and all readings were noted as before. The difference between top & bottom of BS & FS of a point was calculated and multiplied by 100 to find difference in horizontal distance.
(vi) If difference was more than 1m, readings were taken again for that setting.
(vii) After this instrument was kept between TP1 and TP2 by pacing for balancing the sight and this process was repeated upto TBM2.

CALCULATIONS:

(1) For Forward:

Arithmetic check:

Σ Rise = Σ Fall = Σ BS − Σ FS = Last RL − First RL

0.638 − 5.352 = 14.353 − 19.067 = 1290.086 − 1294.800

−4.714 = −4.714 = −4.714

h_1 = 4.714 m

(2) For Backward,

Arithmetic check

Σ Rise − Σ Fall = Σ BS − Σ FS

or, 5.309 − 0.607 = 24.407 − 19.705

4.702 = 4.702

or, h_2 = 4.702 m

Pulchowk Campus Pulchowk

Department of Civil Engineering

Survey Instruction Committee

Group No: H3

Observer :

Recorder :

Instrument :

Fly Levelling (RL Transfer)

Rise and Fall Method

Date : 2080-03-13

Weather:

Temperature:

Station / Chainage	BS			HI	S1 (T-B)	FS			Mean FS	S2 (T-B)	Rise	Fall	Elevation (m)	Stadia S=S1+S2	Hz. Dst (m) Sx100	Remarks
	Top	Mid	Bot			Top	Mid	Bot								
culvert (CV)	1.028	0.981	0.935	0.981	0.093								1294.800	0.093	9.3	
TP_1	0.836	0.790	0.743	0.790	0.093	1.967	1.923	1.878	1.923	0.089		0.942	1293.858	0.182	18.2	
TP_2	1.064	1.025	0.985	1.025	0.079	1.973	1.932	1.889	1.931	0.084		1.141	1292.717	0.163	16.3	
TP_3	0.912	0.873	0.834	0.873	0.078	1.879	1.839	1.799	1.839	0.080		0.814	1291.903	0.158	15.8	
TP_4	1.139	1.092	1.045	1.092	0.095	1.875	1.835	1.795	1.835	0.080		0.962	1290.941	0.175	17.5	
TP_5	1.381	1.336	1.291	1.336	0.090	1.573	1.524	1.475	1.524	0.098		0.432	1290.509	0.188	18.8	
TP_6	1.189	1.138	1.087	1.138	0.102	1.655	1.606	1.558	1.606	0.097		0.270	1290.239	0.199	19.9	
TP_7	1.363	1.318	1.273	1.318	0.091	1.549	1.503	1.457	1.503	0.092		0.365	1289.874	0.183	18.3	
TP_8	1.440	1.391	1.342	1.391	0.098	1.649	1.603	1.557	1.603	0.092		0.285	1289.589	0.190	19.0	
TP_9	1.425	1.376	1.326	1.376	0.099	1.507	1.463	1.419	1.463	0.088		0.072	1289.517	0.187	18.7	
TP_{10}	1.630	1.579	1.529	1.579	0.101	1.495	1.446	1.395	1.445	0.100		0.069	1289.448	0.201	20.1	
TP11	1.508	1.454	1.401	1.454	0.107	1.503	1.454	1.401	1.453	0.102	0.126		1289.574	0.209	20.9	
(FH) Hoisted						0.998	0.942	0.886	0.942	0.112	0.512		1290.086	0.112	11.2	
				ΣBS =					ΣFS =		ΣRise =	ΣFall =			d_1 =	
				14.353					19.067		0.638	5.352			224.000	

Signature of Teacher at site.....

Page No:

Tribhuvan University
Institute of Engineering
Pulchowk Campus Pulchowk

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Department of Civil Engineering
Survey Instruction Committee

Group No: H3

Date : 2080-03-13

Observer :
Recorder :
Instrument :

Weather:
Temperature:

Fly Levelling (RL Transfer)
Rise and Fall Method

Stations Chainage	BS			Mean BS	S_1	FS			Mean FS	S_2	Rise (+)	Fall (-)	Elevation (m)	Stadia Interval $S=S_1+S_2$	Hz. Dst (m) Sx100	Remarks
	Top	Mid	Bot		(T-B)	Top	Mid	Bot		(T-B)						
FH (Hoste)	0.900	0.867	0.832	0.866	0.068									0.068	6.800	
TP1	1.453	1.418	1.382	1.418	0.071	1.442	1.401	1.368	1.403	0.074		0.537		0.145	14.500	
TP2	1.502	1.464	1.426	1.464	0.078	1.466	1.433	1.400	1.433	0.066		0.015		0.142	14.200	
TP3	1.484	1.429	1.394	1.429	0.070	1.513	1.476	1.439	1.476	0.074		0.012		0.144	14.400	
TP4	1.423	1.389	1.355	1.389	0.068	1.479	1.442	1.400	1.440	0.079		0.011		0.147	14.700	
TP5	1.384	1.346	1.310	1.347	0.074	1.369	1.334	1.299	1.334	0.070	0.055			0.144	14.400	
TP6	1.568	1.536	1.503	1.536	0.065	1.414	1.378	1.344	1.379	0.070		0.032		0.135	13.500	
TP7	1.527	1.494	1.458	1.493	0.069	1.338	1.304	1.270	1.304	0.068	0.232			0.137	13.700	
TP8	1.538	1.504	1.469	1.504	0.069	1.261	1.225	1.189	1.225	0.072	0.268			0.141	14.100	
TP9	1.546	1.509	1.472	1.509	0.074	1.304	1.269	1.230	1.268	0.074	0.236			0.148	14.800	
TP10	1.614	1.575	1.537	1.575	0.077	1.293	1.259	1.226	1.259	0.067	0.250			0.144	14.400	
TP11	1.850	1.813	1.775	1.813	0.075	1.344	1.310	1.274	1.309	0.070	0.266			0.145	14.500	
TP12	1.991	1.953	1.922	1.955	0.069	1.043	1.008	0.973	1.008	0.070	0.805			0.139	13.900	
TP13	1.998	1.968	1.932	1.966	0.066	0.981	0.948	0.914	0.948	0.067	1.007			0.133	13.300	
TP14	1.688	1.653	1.619	1.653	0.069	0.949	0.916	0.884	0.916	0.065	1.050			0.134	13.400	
TP15	1.521	1.490	1.459	1.490	0.062	1.018	0.978	0.939	0.978	0.079	0.675			0.141	14.100	
TBM (Chiwal)						1.060	1.025	0.990	1.025	0.070	0.465			0.070	7.000	

$\Sigma BS = 24.407$ $\Sigma FS = 19.705$ $\Sigma Rise = 5.309$ $\Sigma Fall = 0.607$

$d_2 = 225.700 m$

Signature of Teacher at site.....

Page No:

Error $= h_2 - h_1 = 4.714 - 4.702 = 0.012\,m = 12\,mm$

permissible error $= \pm 24\sqrt{K}$

$= \pm 24\sqrt{d_1 + d_2}$

$= \pm 24\sqrt{0.224 + 0.2257}$

$= \pm 16.094\,mm$

RESULT:

The difference in elevation between two points are found to be 4.708 m and horizontal distance is found to be 225.700m.

RL of Fire hydrant $= 1294.800 - \frac{4.702 + 4.714}{2} = 1290.092$ m.

DISCUSSION AND CONCLUSION:

Hence, from this survey we came to the conclusion that the height difference between any two points can be found out using the level instrument and that the elevation of unknown point can be found out by level transfer from known point to that point. The causes of error might be parallax error and level might not be perfectly horizontal. Also, there might be certain error in instrument.

PRECAUTIONS:

(i) Foresight & Back sight distance should be maintained equal by pacing.

(ii) staff reading should not be less than 0.6m & more than 2m.

(iii) The difference between average & mid wire reading should be less than 3mm.

(iv) Reading must be taken carefully.

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
PULCHOWK CAMPUS

A LAB REPORT
ON

PROFILE LEVELLING

Lab No.: 06
Experiments Date: 2080-03-27
Submission Date: 2080-09-01

SUBMITTED BY:
Name: Surendra Sharma
Group: H3
B. H No.: 078BCE178

SUBMITTED TO:
Department of
Civil Engineering

TITLE: PROFILE LEVELLING

OBJECTIVE:

(i) TO plot the L-section and X-section of given ground surface.

(ii) TO compute RL and HI and their difference between two given points.

INSTRUMENT AND ACCESSORIES:

(i) Auto level
(ii) Levelling staff
(iii) Measuring tape
(iv) Foot plate
(v) Marking arrows

THEORY:

Profile: The operation of levelling carried out to determine the elevation of point of known distance apart and also other salient features along a straight line. If we plot the elevation of ordinate gives the profile of surface of earth. It is also called longitudinal levelling.

Cross-section: It is the operation of levelling which is carried out to provide the levels on either side of main line at right angle in order to determine vertical section of earth surface on ground.

The horizontal distances are plotted along horizontal lines to convinient scale: The elevation are plotted along vertical ones.

Procedure:

First of all, level was get up of convinient station and BS was taken on a level staff held vertically on BM. The levelling staff was held sucessively on the point along the profile line (at regular distance say 15m) and regards were entered as intermediate sight. The cross section was also taken perpendicular to longitudinal line at regular interval. The chainage of points were noted in level book.

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Tribhuvan University
Institute of Engineering
Central Campus Pulchowk, Lalitpur, Nepal
DEPARTMENT OF CIVIL ENGINEERING
Survey Instruction Committee

Observer : .....
Recorder : .....
Instrument : .....

Weather : .....
Temperature : .....
Date : .....

Level Field Book for L-Section and X-Section

Points	Left Offset	Center Line Chainage	Right Offset	BS	IS	FS	HI	Elevation (m)	Remarks
TBM1 (culvert)				0.855			1295.655	1294.800	
		0+000			0.472			1295.183	
		0+015			1.000			1294.655	
	5m				1.092			1294.563	
	9.5m				1.107			1294.548	
	10m				3.152			1292.503	
			5m		1.881			1293.774	
			10m		1.308			1294.347	
		0+030			1.639			1294.016	
		0+045		0.833		2.780	1293.708	1292.875	CP_1
	5m				2.751			1290.957	
	9.3m				2.788			1290.920	
	10m				4.816			1288.892	
			5m		2.452			1291.256	
			10m		1.419			1292.289	
		0+060			1.872			1291.836	
		0+075		1.018		2.806	1291.920	1290.902	CP_2
		0+090			1.351			1290.569	
		0+105			1.603			1290.317	
		0+120			2.001			1289.919	
	5m				1.643			1290.277	
	9m				1.518			1290.402	

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Tribhuvan University
Institute of Engineering
Central Campus Pulchowk, Lalitpur, Nepal
DEPARTMENT OF CIVIL ENGINEERING
Survey Instruction Committee

Observer : .....
Recorder : .....
Instrument : .....

Weather : .....
Temperature : .....
Date : .....

Level Field Book for L-Section and X-Section

Points	Left Offset	Center Line Chainage	Right Offset	BS	IS	FS	HI	Elevation (m)	Remarks
	10m	0+120			4.271		[illegible]	1287.649	
			5m		1.986			1289.934	
			10m		1.112			1290.808	
		0+135		0.961		2.260	1290.621	1289.660	CP_3
		0+150			1.212			1289.409	
		0+165			1.312			1289.309	
		0+180			1.307			1289.314	
	5m				1.412			1289.209	
	10m				1.346			1289.275	
			5m		1.344			1289.277	
			8.325m		1.394			1289.227	
			8.325m		0.672			1289.949	
		0+195			1.290			1289.331	
	5m				1.410			1289.211	
	10m				1.330			1289.291	
			5m		1.361			1289.260	
			10m		1.388			1289.233	
		0+210		1.348		1.315	1290.654	1289.306	CP_4
		0+225			1.402			1289.252	
		0+240			1.255			1289.399	
	5m				1.275			1289.379	
	10m				1.462			1289.192	
			5m		2.180			1288.474	
			10m		2.204			1288.450	
		0+255			1.140			1289.514	
(FH) Hash						0.798		1289.856	TBM_2

OBSERVATION

OBSERVED RL of FH = ~~1289.09~~ 1289.856m

Given RL of FH (From Fly levelling) = 1290.092 m

error = Observed RL - Given RL

= 1289.856 - 1290.092

= -0.236m

There are total 4 change point and 1 TBM thus total 5 points to be corrected.

Thus,

correction for $CP_1 = \frac{l_1}{\Sigma l} \times +0.236$

$= \frac{45}{255} \times +0.236 = +0.042\,m$

correction for $CP_2 = \frac{l_1+l_2}{\Sigma l} \times +0.236$

$= \frac{75}{255} \times +0.236 = +0.069\,m$

correction for $CP_3 = \frac{l_1+l_2+l_3}{\Sigma l} \times +0.236$

$= \frac{135}{255} \times +0.236 = +0.125\,m$

correction for $CP_4 = \frac{l_1+l_2+l_3+l_4}{\Sigma l} \times +0.236$

$= \frac{210}{255} \times +0.236 = +0.194\,m$

correction for TBM_2 (FH) $= \frac{\Sigma l}{\Sigma l} \times +0.236$

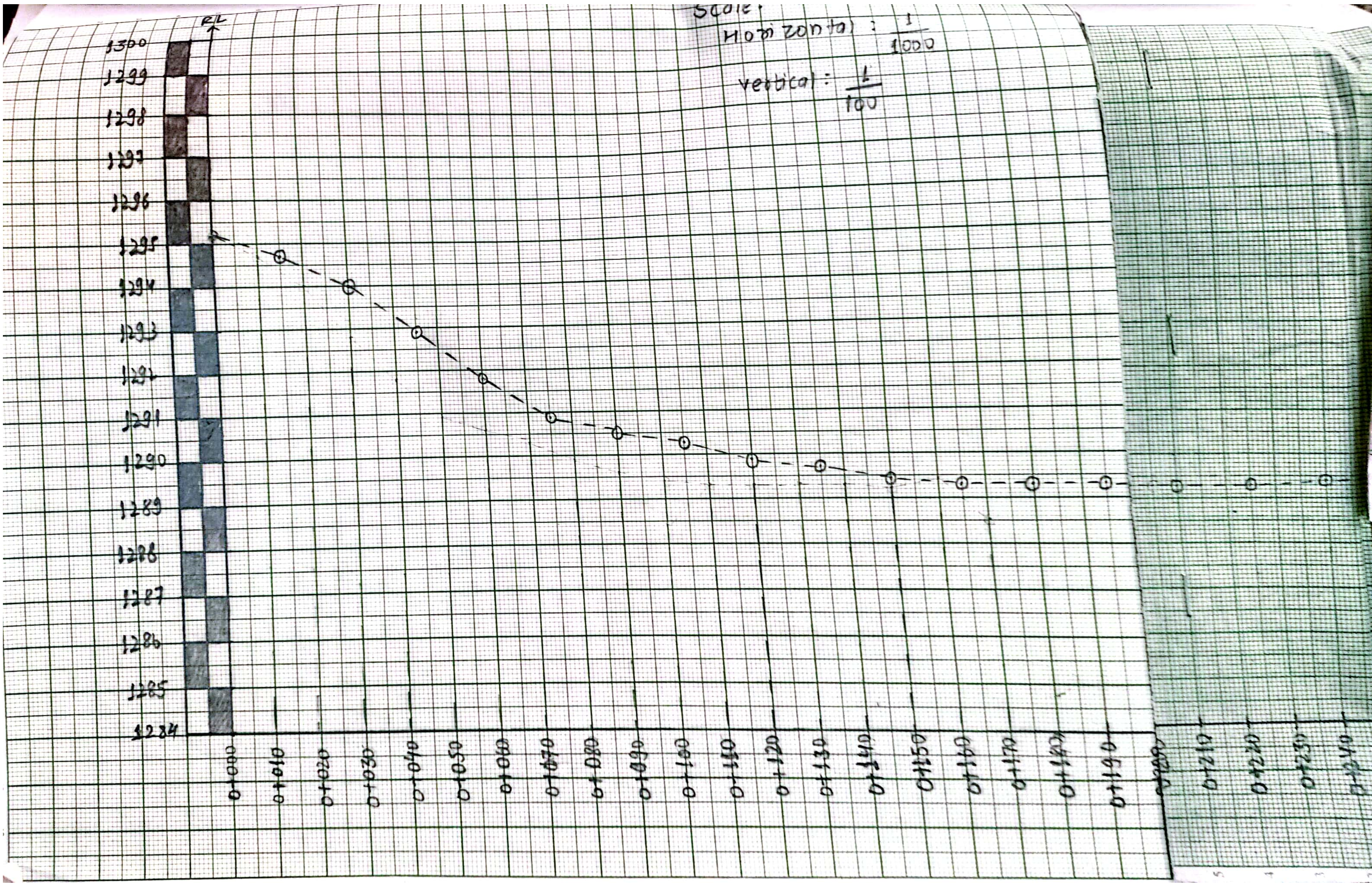
$= \frac{255}{255} \times +0.236$

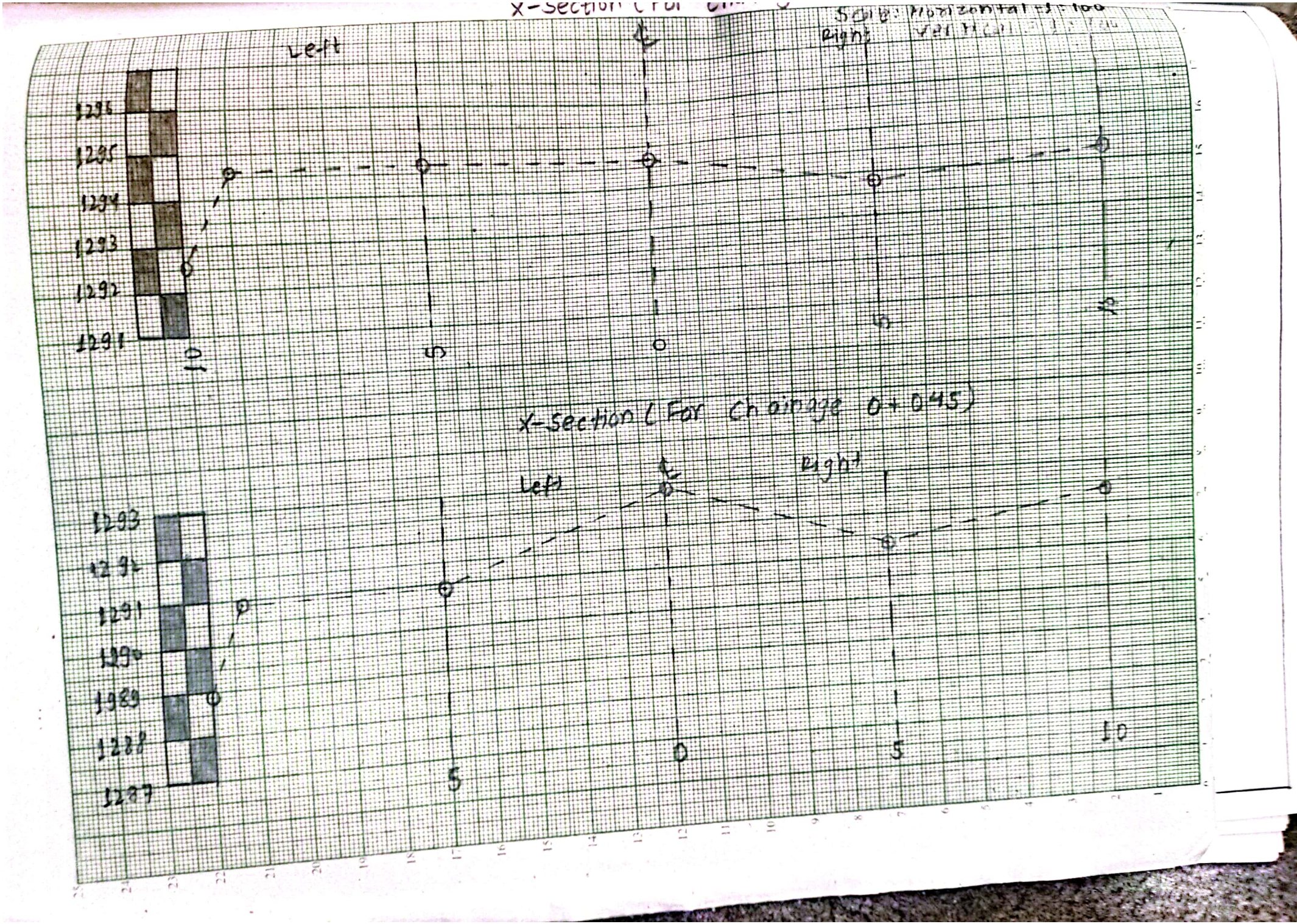
$= +0.236\,m$

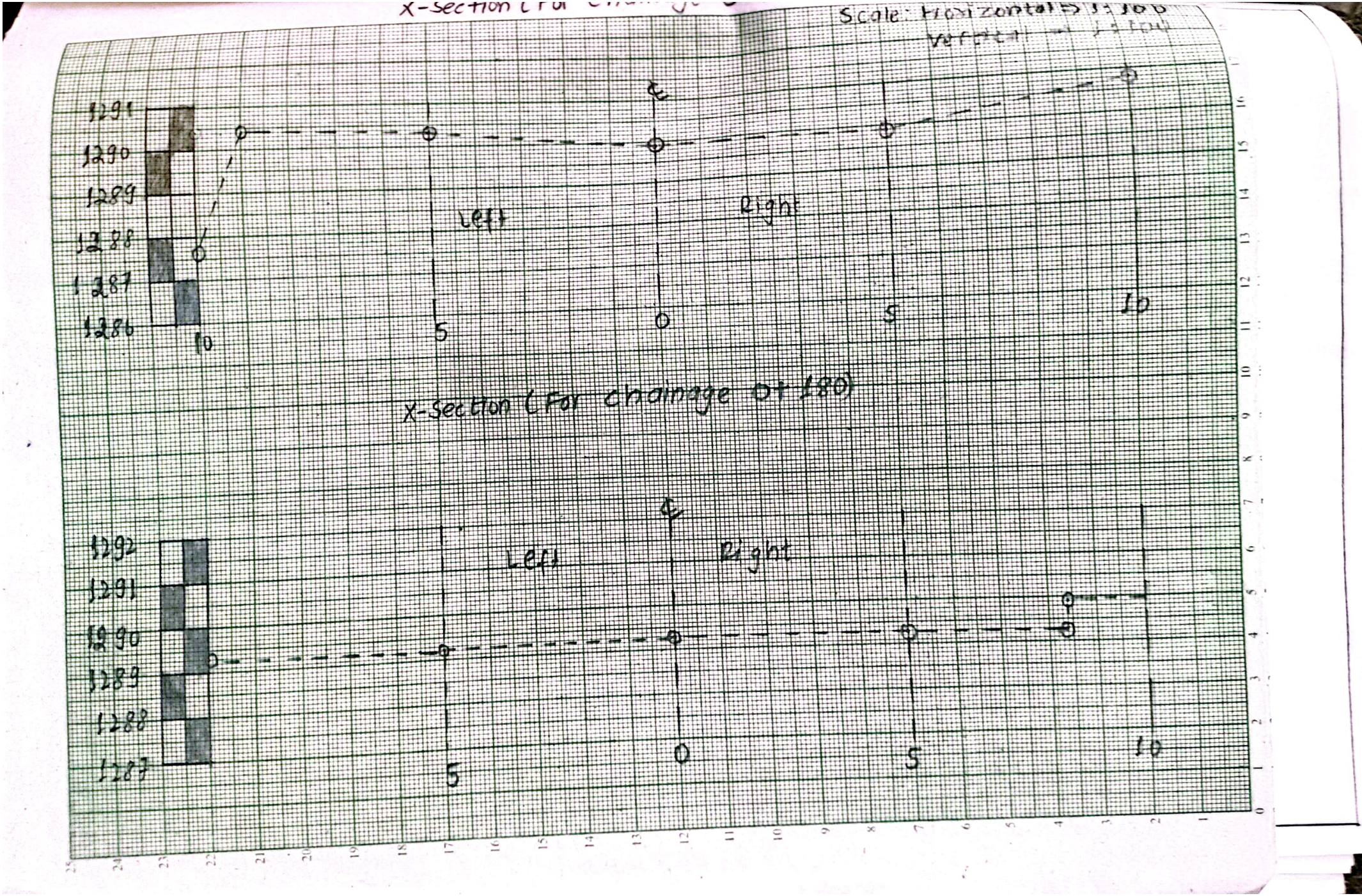
Elevation / RL with correction.

Points	Left offset	Center line Chainage	Right offset	Elevation/ RL (m)	Correction	Corrected Elevation(m)	Remarks
TBM1 (culvert)				1294·800	0	1294·800	
		0+000		1295·183	+0·042	1295·225	
		0+015		1294·655	+0·042	1294·697	
	5m			1294·563	+0·042	1294·605	
	9·5m			1294·548	+0·042	1294·590	
	10m			1294·503	+0·042	1294·545	
			5m	1293·774	+0·042	1293·816	
			10m	1294·347	+0·042	1294·389	
		0+030		1294·016	+0·042	1294·058	
		0+045		1292·875	+0·042	1292·917	CP1
	5m			1290·957	+0·042	1290·999	
	9·3m			1290·920	+0·042	1290·962	
	10m			1288·892	+0·042	1288·934	
			5m	1291·256	+0·042	1291·298	
			10m	1292·289	+0·042	1292·331	
		0+060		1291·836	+0·069	1291·905	
		0+075		1290·902	+0·069	1290·971	CP2
		0+090		1290·569	+0·125	1290·694	
		0+105		1290·317	+0·125	1290·442	
		0+120		1289·919	+0·125	1290·044	
	5m			1290·277	+0·125	1290·402	
	9m			1290·402	+0·125	1290·527	
	10m			1287·649	+0·125	1287·774	
			5m	1289·934	+0·125	1290·059	
			10m	1290·808	+0·125	1290·933	
		0+135		1289·660	+0·125	1289·785	CP3

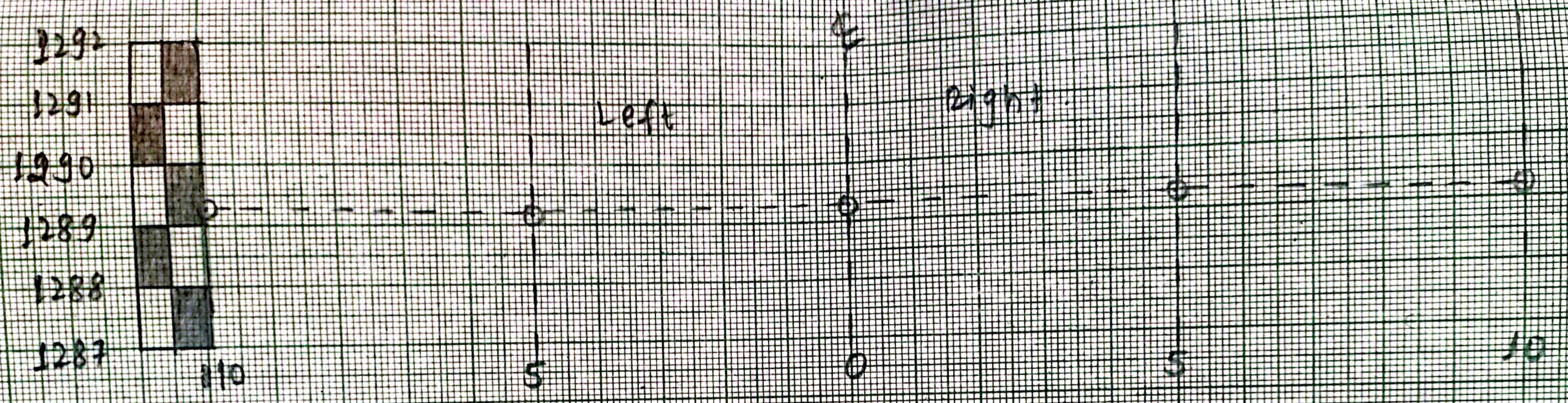
Point	Left offset	Centerline chainage	Right offset	Elevation/ RL (m)	Correction (m)	Corrected Elevation(m)	Remark
		0+150		1289.409	+0.194	1289.603	
		0+165		1289.309	+0.194	1289.503	
		0+180		1289.314	+0.194	1289.508	
	5m	0+180		1289.209	+0.194	1289.403	
	10m			1289.275	+0.194	1289.469	
			5m	1289.277	+0.194	1289.471	
			8.325m	1289.227	+0.194	1289.421	
			8.325m	1289.949	+0.194	1290.143	
		0+195		1289.331	+0.194	1289.525	
	5m			1289.221	+0.194	1289.415	
	10m			1289.291	+0.194	1289.485	
			5m	1289.260	+0.194	1289.454	
			10m	1289.233	+0.194	1289.427	
		0+210		1289.306	+0.194	1289.500	CP4
		0+225		1289.252	+0.236	1289.446	
		0+240		1989.399	+0.236	1289.593	
	5m			1289.379	+0.236	1289.573	
	10m			1289.192	+0.236	1289.428	
			5m	1288.474	+0.236	1288.710	
			10m	1288.450	+0.236	1288.686	
		0+255		1289.514	+0.236	1289.750	
FH (MOSSE)				1289.856	+0.236	1290.092	TBM_2


Scale:
Horizontal : 1/1000
vertical : 1/100
RL
1300
1299
1298
1297
1296
1295
1294
1293
1292
1291
1290
1289
1288
1287
1286
1285
1284
0+000
0+010
0+020
0+030
0+040
0+050
0+060
0+070
0+080
0+090
0+100
0+110
0+120
0+130
0+140
0+150
0+160
0+170
0+180
0+190
0+200
0+210
0+220
0+230
0+240

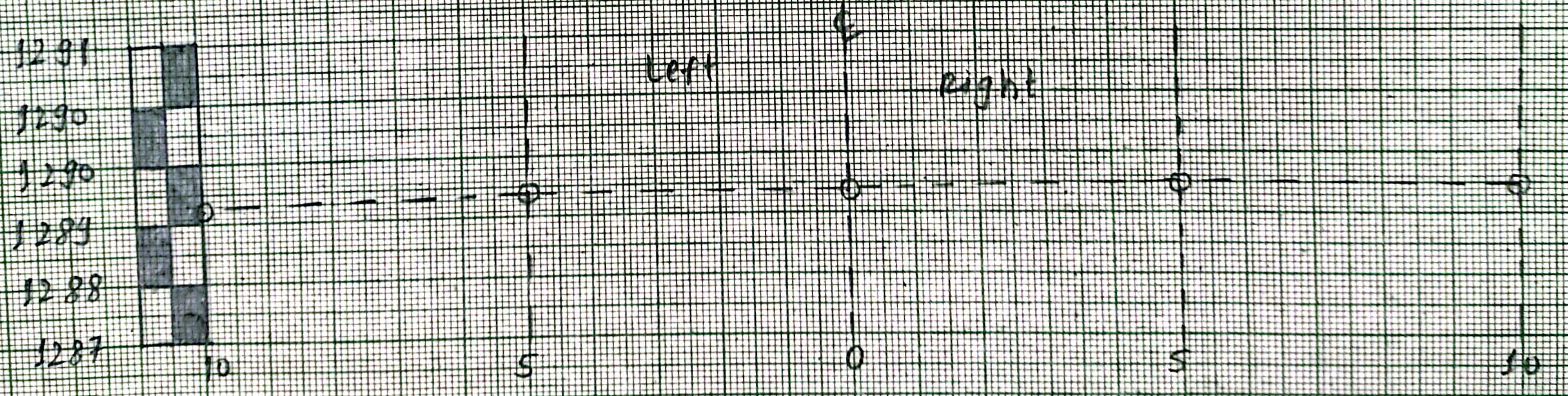

X-section C For Ch
Left
Right
1296
1295
1294
1293
1292
1291
5
0
5
10
X-section C For Chainage 0+045
Left
Right
1293
1292
1291
1290
1289
1288
1287
5
0
5
10


X-section (For chainage of 180)
Scale: Horizontal
Left
Right
1291
1290
1289
1288
1287
1286
10
5
0
5
10
1292
1291
1290
1289
1288
1287
Left
Right
5
0
5
10

Scale: Horizontal
Vertical



X-Section (For Chainage 0+240)



RESULT

Hence, the longitudinal section of ground level from TBM_1 to TBM_2 were plotted in a scale as shown. Also, the elevations of different points were computed. The cross-section was also plotted at different chainage.

CONCLUSION

Hence, from this survey work, with the use of levelling instrument, the elevation at different point of longitudinal and cross-sectional was tabulated and plotted in graph.

PRECAUTIONS

(i) Level must be well focused on staff.
(ii) Staff must be perfectly vertical.

TRIBHUVAN UNIVERSITY

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A LAB REPORT

ON

ORIENTATION OF THEODOLITE

LAB NO: 07

EXPERIMENTS DATE: 2080-04-03

SUBMITTED DATE: 2080-05-01

SUBMITTED BY:

Name: Surendra Sharma
Group: H3
Roll No: 078BCE178

SUBMITTED TO:

Department of
Civil Engineering

TITLE: ORIENTATION OF THEODOLITE

OBJECTIVES:

(i) To be familiar with theodolite
(ii) To be able to make temporary adjustments of theodolite.
(iii) To be able to measure horizontal and vertical angle.

INSTRUMENTS AND ACCESSORIES USED:

(i) Theodolite - 1
(ii) Tripod - 1
(iii) Ranging Rods - 3
(iv) Plumb bob - 1
(v) Hammer - 1
(vi) Peg - 1

THEORY

Theodolite is the most precise instrument for measuring horizontal and vertical angle and has the work applicability in surveying such as laying the horizontal angles, locating survey lines, establishing grade, determining the difference in elevation, setting curvatures, etc. The theodolite may be transit or non-transit. A transit type theodolite is one in which line of sight can be reversed by revolving the telescope through 180°, in vertical plane. In non-transit type, telescope cannot be transited and become absolute.

Essential parts

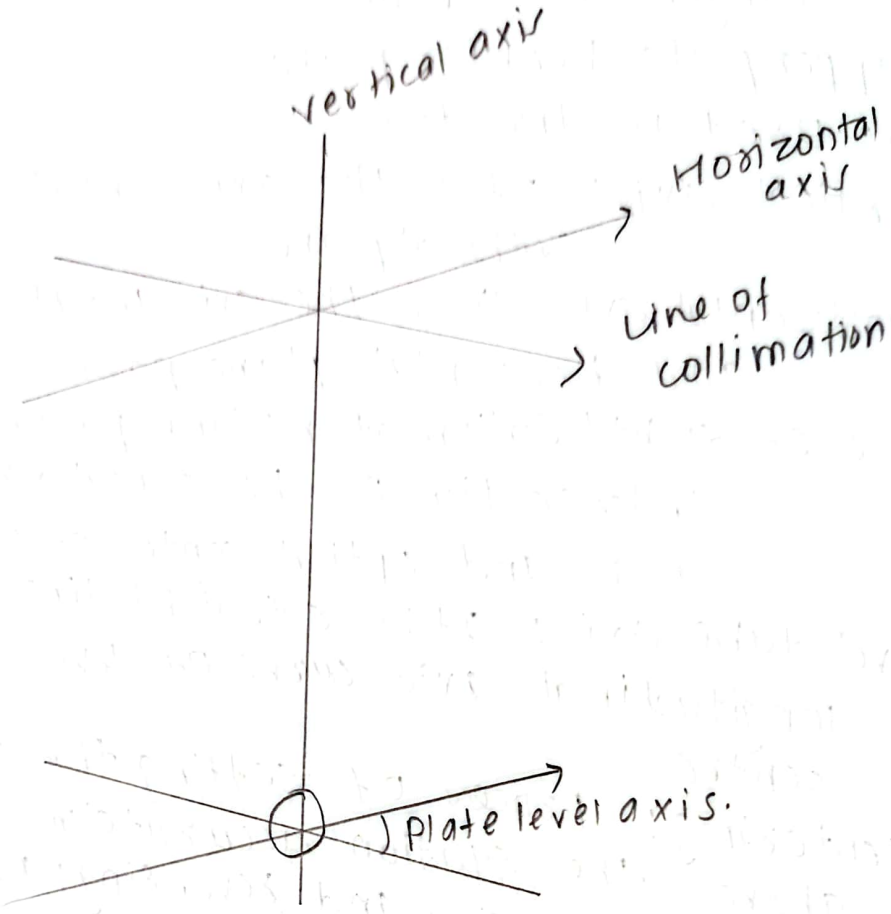
(i) Telescope: Mounted on spindle; integral part
(ii) Vertical circle: circular graduation and attached to horizontal axis of telescope.
(iii) Index frame/ Vernier frame
(iv) Levelling Head: To support the main part of instrument.

v. Two spindles
vi. Lower plate/Scale plate: carries horizontal circle, lower clamp screw corresponding to lower tangential screw.
vii. Upper plate/Vernier plate

Terms used in Theodolite

(i) Vertical axis: It is the axis about telescope and vertical plane.
(ii) Horizontal axis: It is the axis about which telescope and horizontal plane passes.
(iii) Line of sight/Collimation: Line passing through intersection of horizontal & vertical cross bar and optical centre of object glass.
(iv) Level tube axis: It is straight line tangential to longitudinal axis curve of level tube and its centre.
(v) Centering: Proces of setting theodolite directly above the station accurately.
(vi) Toansiting, plunging and reversing: Proces of turning telescope in horizontal plane.
(vii) Face left observation: The face of vertical circle is at the left of observer
(viii) Telescope normal: When face of vertical circle is left and bubble up telescope normal.
(ix) Temporary adjustment: It is made at every instrument setting fair to take observation.
(a) Setting up theodolite
(b) Levelling
(c) Centering
(d) Removal of parallax.

Parallax: To bring image on plane of cross wire.


vertical axis
Horizontal axis
Line of collimation
Plate level axis.

Procedure:

(i) Required instrument taken to field.

(ii) Centering, leveling and focusing were done simultaneously turn by tuon and multiple repitition levelling was checked.

(iii) Objects were sighted and required data were noted for two set of reading
Set I: 0° Face left, 180° Face right
Set II: 90° Face left, 270° face right.

(iv) Data was taken and calculation was done.

OBSERVATION:

Instrument Station (HI)	Sighted TO	Face	Set I	Face Angle	Mean Set I	Set II	Face Angle	Mean Set II	Horizontal Mean Angle (set I + set II)/2	Vertical angle	Remarks
O	A	L	00°00'	125°14'	∠AOB = 125° 13'30"	90°00'	125°17'	∠AOB = 125°16' 30"	∠AOB 125° 15'		
	B	L	125°14'			215°17'					
	A	R	180°00'	125°13'		270°00'	125°16'				
	B	R	305°13'			35°16'					
	C	L	182°47'	57°33'	∠BOC = 57°33'	272°46'	57°29'	∠BOC = 57°29'30"	∠BOC = 57°31' 15"		
	C	R	2°46'	57°33'		92°46'	57°30'				
	A	L	00°01'	177°14'	∠COA = 177°14'	90°02'	177°17'	∠COA = 177°16' 30"	∠COA 177° 15'15"		
	A	R	180°00'	177°14'		270°00'	177°16'				
					360° 0'30"			360° 2'30"	360° 01'30"		

Observed sum = 360°01'30"

Theoretical sum = 360°00'00"

Error = Observed sum − Theoretical sum

= 360°01'30" − 360°

= 01'30"

Permissible = $1'\sqrt{3}$ = 01'43.92" ≈ 01'44"

correction on each angle = $-\frac{1'44"}{3}$ = -34" (one angle -35")

Corrected angle :-

∠AOB = 125°15' − 34" = 125°14'26"

∠BOC = 57°31'15" − 34" = 57°30'41"

∠COA = 177°15'15" − 35" = 177°14'40"

CONCLUSION

Hence, we handled the theodolite and calculated the angle between the liner by noting face left and face right angles. We adjusted error as it was within permissible.

Sources of Error

(i) Inaccurate targeting

(ii) Centering and levelling may not been done perfectly.

(iii) Inappropriate reading.

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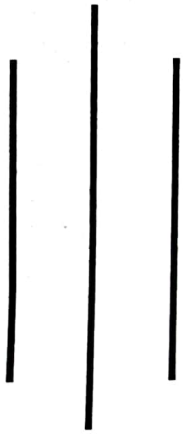
A LAB REPORT

ON

TRAVERSE BY TOTAL STATION



LAB NO: 08

EXPERIMENTS DATE: 2080-04-17

SUBMITTED DATE: 2080-05-01

SUBMITTED BY:

Name: Surendra Sharma
Group: H3
Roll No: 078BCE178

SUBMITTED TO:

Department of
Civil Engineering.

TRAVERSE BY TOTAL STATION EDM MODE

Total station is a modern surveying equipment, combination of Electromagnetic Distance Measuring Instrument and electronic theodolite. It is also integrated with microprocessor, electronic data collector, and storage system. The instrument can be used to measure horizontal and vertical angles as well as horizontal distance, sloping distance of object from instrument.

Instruments used

(i) Total station
(ii) Prism Pole
(iii) Wooden peg
(iv) Plumb bob
(v) Hammer
(vi) Tripod stand.

OBJECTIVES

(i) To be familier with total station
(ii) To be able to measure horizontal distance and angles.

ESSENTIAL PARTS OF TOTAL STATION:

(i) Collimator
(ii) Eyepiece ring
(iii) Eyepiece
(iv) Display panel and keyboard
(v) Battery pack
(vi) Clamp screw
(vii) Base plate
(viii) levelling screw

Procedure:

(i) ~~Centering~~ Minimum 5 stations were established to form closed polygon using wooden peg maintaing leg ratio (better than 2:1) and Avoiding acute angle (< 30°) and straight angle (180° ± 20°). Stations marked as A, B, C, D, E.

(ii) Total station was centered and levelled in station A and prism pole was set in station E.

(iii) Reading for set I and set II angles were taken along with horizontal length/distance.

(iv) Process was repeated for each stations.

Precautions:

(i) Proper levelling and centering of instruments should be done

(ii) Do not sit on total station cover box.

(iii) Always carry total station in its case.

(iv) Clamp should be opened while fitting total station in its case.