Kathmandu University

School of Engineering

Department of Civil Engineering

Surveying Field Camp Report 2022

(September 3rd – September 16th, 2023)

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Acknowledgement

Survey Camp is a credited course for 4th semester students of B.E. in Civil Engineering. This is a closed camp of 14 days in which students conduct topographic survey of the area which includes traversing, tachometry and trigonometric levelling, road alignment and geometric design and building layout. The closed camp is designed to supplement the theoretical knowledge learned in the classroom.

This document reports on the 14 days closed survey camp of the students of civil engineering batch 2020 conducted in between September 3rd and September 16th. The camp was organized by Department of Civil Engineering, Kathmandu University. It was held on premises of MARS Engineering Survey Camp, Bungamati, Lalitpur.

This report covers the information about field works carried out throughout the camp along with their outcomes including computation and plotting. The survey camp aimed at developing our practical engineering skills through applying our theoretical background of engineering survey from Survey volume I and Survey volume II.

We are grateful to Department of Civil Engineering for granting us this opportunity to uplift our engineering skills through this survey camp. We would like to express our utmost gratitude to the Head of Department, Honorable Associate. Prof. Dr Shyam Sundar Khadka and our instructor Asst. Prof. Manish Prakash , Er. Sudip Bajgain, Er. Raju Bhele, Er. Jenisha Dumaru and technical staff Mr. Chetan Sushling who guided us and cooperated with us at all times. We are also grateful to all the friends who cooperated with us and made this educational journey successful.

Table of Contents

1. Introduction i

1.1 Principle of Surveying: 2

1.1.1 Working from whole to part: 2
1.1.2 Location of point by measurement from two points of reference 2
1.1.3 Independent Check: 2
1.1.4 Accuracy required: 2

1.2 Accuracy and Errors: 2

Precision 2
Accuracy: 3

1.3 Sources of error 3

1.3.1 Natural errors 3
1.3.2 Instrumental errors 3
1.3.3 Personal errors 3

1.4 Type of error 3

1.4.1 Mistakes 3
1.4.2 Systematic error 3
1.4.3 Accidental error 3

1.5 Permissible Error 4
1.6 Name of the project: 4
1.7 Description of the project: 4

Location: 4
Sites: 4
Geographical Features: 4

1.8 Objectives: 5

2. Project Area 5

2.1 Location and Accessibility 5
2.2 Topography and Geology 5
2.3 1.3 Rainfall and Climatic condition 5
2.4 1.4 Others 6

3. Topographical Survey 6

3.1 Objectives 7
3.2 Brief description of area 7
3.3 Norms (Technical specification) 7
3.4 Equipment 8

3.4.1 For recce 8
3.4.2 For leveling 8
3.4.3 For tacheometer traversing 8
3.4.4 Detailing with tacheometer 8

3.5 Methodology 9

3.5.1 Reconnaissance 9
3.5.2 Major Traverse 9
3.5.3 Minor Traverse 10
3.5.4 Detailing 10
3.5.5 Leveling 10
3.5.6 Computation and plotting 11
3.5.7 Comments and conclusion 11

4. Total Station 12

4.1 Description 12
4.2 Advantages of total station 12
4.3 Task performed during the camp 13

4.3.1 Finding out the unknown coordinates 13
4.3.2 Stake out 13

4.4 Conclusion 13

5. Analytical Intersection and Resection 14

5.1 Intersection 14

5.1.1 Procedure 14
5.1.2 Calculation with Data Acquired on Field 15

5.2 Resection (Three-Point) 17

5.2.1 Steps of Analytical Resection 17
5.2.2 Calculation with Data Acquired on Field 18

6. Layout of Building 21

6.1 Brief Description of Layout 21
6.2 Norms 21
6.3 Location and Site Plan 22
6.4 Equipment 22
6.5 Methodology 22

6.5.1 Site Selection 22
6.5.2 Topographical Survey 23
6.5.3 Determination of Area 23
6.5.4 Steps of Layout 24

6.6 Comments and Conclusion 25

7. Bridge site survey 25

7.1 Objectives 26
7.2 Brief description of the area 26
7.3 Hydrology, geology and soil 27
7.4 Norms (Technical Specification) 27
7.5 Equipment 27
7.6 Methodology 27

7.6.1 Site selection 27
7.6.2 Topographical Survey 28

7.6.3 Longitudinal section and cross section. 28
7.6.4 Leveling 29
7.6.5 Reciprocal Leveling 29
7.6.6 Detailing 30
7.6.7 Computation and plotting 30
7.7 Comments and conclusion 32
8 Road Alignment and Geometry Design 33
8.1 Brief Description of the Project Area 33
8.2 Hydrology, Geology and Soil 33
8.3 Norms (Technical Specification) 34
8.4 Equipment 34
8.5 Methodology 35
8.5.1 Horizontal Alignment 35
8.5.2 Vertical Alignment 35
8.5.3 Levelling 36
8.5.4 Longitudinal Section 36
8.5.5 Cross Section 36
8.5.6 Topographical survey of road corridor 36
8.6 Comments Conclusion 36

List of Figures

Figure 1: MARS Nepal Survey Camp 4
Figure 2: Google image of survey camp site. 6
Figure 3: Open Traverse 9
Figure 4: Closed Traverse 10
Figure 5: Levelling 11
Figure 6: Total Station Theodolite 12
Figure 7:Intersection method of determining co-ordinates of an unknown station 14
Figure 8: Resection 17
Figure 9: Building layout 23
Figure 10:Plan of building layout 24
Figure 11: Using Triangulation method to determine length of bridge axis. 26
Figure 12: Reciprocal Levelling 29
Figure 13: Triangulation Plot for Bridge Survey 31
Figure 14 : Road site Survey 33

List of Tables

Table 1: Distance measurement sheet 37
Table 2: Horizontal Angle Sheet 38
Table 3: Traverse Computation Sheet 39
Table 4:Precise Levelling sheet 40
Table 5: Adjustment of level 41
Table 6: Ordinary Levelling Sheet 42
Table 7: Tacheometric Sheet CP1 45
Table 8: Tacheometric Sheet 9M1 46
Table 9: Tacheometric Sheet 9M2 47
Table 10: 9M3 48
Table 11:Tacheometric Sheet 9M4 49
Table 12:Tacheometric Sheet 9M5 50
Table 13:Tacheometric Sheet 9M6 51
Table 14:Tacheometric Sheet 9M7 53
Table 15:Tacheometric Sheet 9M8 54
Table 16:Tacheometric Sheet 9M9 55
Table 17:Tacheometric Sheet 9M10 56
Table 18:Tacheometric Sheet 9M10 57
Table 19:Tacheometric Sheet 9M11 58
Table 20:Tacheometric Sheet 9M12 59
Table 21:Tacheometric Sheet 9M13 60
Table 22:Tacheometric Sheet 9M13 61
Table 23:Tacheometric Sheet 9M14 62
Table 24:Tacheometric Sheet CP2 63
Table 25:Road Angle Sheet 64
Table 26:Road Alignment Sheet 66
Table 27: Cross levelling and Profile levelling sheet 67
Table 28:Bridge Survey (Angle Computation Sheet) 88
Table 29:Bridge Levelling Sheet 90

1. Introduction

Surveying is the process of determining the relative position of natural and man-made features on or under the earth's surface, the presentation of this information either graphically in the form of plans or numerically in the form of tables and the setting out of measurements on the earth's surface. It usually involves measurements, calculations, the production of plans, and the determination of specific locations.

Surveyors work with elements of geometry, trigonometry, regression analysis, physics, engineering, metrology, programming languages, and the law. They use equipment, such as total stations, robotic total stations, GS receivers, retroreflectors, 3D scanners, radios, handheld tablets, digital levels, subsurface locators, drones, GIS, and surveying software.

Surveying has been an element in the development of the human environment since the beginning of recorded history. The planning and execution of most forms of construction requireit. It is also used in transport, communications, mapping, and the definition of legal boundaries for land ownership. It is an important tool for research in many other scientific disciplines.

The main objectives of surveying courses allocated for civil engineering students is to promote them the basic knowledge of different surveying techniques relevant to engineering works in their professional practice. The completion of all surveying courses including 17 days' survey camp work organized by the **Department of Civil Engineering, Kathmandu University, Dhulikhel** has directed students to use all surveying technique covered in lecture classes.

Primary division of Surveying:

Primarily, surveying can be divided into plane and geodetic based on the area of land to be surveyed.

In plane surveying, mean surface of the earth is considered as a plane and spheroidal shape is neglected, all triangle formed are considered as plane triangles, level line is considered as straight and plumb line are considered parallel. It is reasonable for the area involving less than250 sq. km

In geodetic surveying, the shape of the earth is taken into account. All lines are curved line, all triangle are spherical triangle so it involves spherical trigonometry. The objective of geodetic survey is to determine the precise position on the surface of the earth, of a system of widely distant point which forms the control station to which survey of less precision may be referred.

1.1 Principle of Surveying:

The fundamental principles of plane surveying are:

1.1.1 Working from whole to part:

It is very essential to establish first a system of control points with higher precision. Minor control points can then be established by less precise method and details can then be located using minor control points by running minor traverse. This principle is applied to prevent the accumulation of error and to control and localize minor error.

1.1.2 Location of point by measurement from two points of reference:

The relative position of points to be surveyed should be located by measurement from at least two (preferably three) points of reference, the position of which have already been fixed.

Consistency in work:

The survey work should be performed by keeping consistency in method, instrument, observer etc. to get desired level of accuracy.

1.1.3 Independent Check:

An independent check should be applied on data when possible. For e.g. measuring all three angles of triangle, even though third angle measurement is redundant.

1.1.4 Accuracy required:

Proper method and proper instrument should be used depending upon amount of accuracy required. Accuracy of angular and linear values should be compatible.

Based on above principles, techniques and usage of instruments, we carried our 15 days 'Surveying Field Camp 2021'as per the requirement of course CIEG-210.

1.2 Accuracy and Errors:

Precision

Precision is the degree of perfection of measuring instruments, the methods and the observations. It is the degree to which the repeated observations under same condition shows the same result.

Accuracy:

Accuracy is the degree of perfection obtained as a result from observation. It is the degree of closeness of observation near to true value. Accuracy depends upon precise instruments, precise methods and good planning.

A discrepancy is the difference between two measured values of the same quantity, it is not an error.

1.3 Sources of error

Error may arise from three sources:

1.3.1 Natural errors

These are the error that arise due to variation in natural phenomenon such as temperature, refraction, magnetic declination etc.

1.3.2 Instrumental errors

These are the errors that arise due to imperfection or faulty adjustment of the instrument with which measurement is being taken. E.g., a tape too short

1.3.3 Personal errors

These are the errors that arise due to want of perfection of human sight in observing and of touch in manipulating instrument. E.g., error in taking level reading.

1.4 Type of error:

Error may be classified as:

1.4.1 Mistakes

These are the errors that may arise due to lack of attention, experience and due to carelessness and confusion in the mind of observer. If these kinds of errors are undetected, it may produce serious effect. Hence, every measurement to be recorded in the field must be checked by independent check.

1.4.2 Systematic error

These are the error that, under the same condition, they will always be of same size and sign, a correction can be determined and applied, these make the result too great or too small accordingly treated as positive or negative error.

1.4.3 Accidental error

These are the types of error which remain after mistake and systematic error have been eliminated and caused by a combination of reason beyond the ability of observer to control. They tend some times in one direction and sometimes in other. Accidental error represented the limit of precision in the determination of value.

1.5 Permissible Error

It is the maximum allowable limit that a measurement might shift from the true value or from a value previously adopted is correct. Its magnitude in some random case relies on the scale, reason for the study, the instrument accessible, class of the work and so on.

1.6 Name of the project:

Surveying Field Camp 2022

1.7 Description of the project:

Location:

MARS Engineering Survey Camp, Bungmati,Lalitpur.

Sites:

For Topographic Survey : MARS Engineering Survey Camp
For Bridge Survey : Bungamati,Lalitpur
For Road Survey :Bungamati , Lalitpur

Geographical Features:

Terrain : Hilly
Weather : Sunny, Partly Cloudy
Google Earth Location:MARS Nepal Survey Camp.

Figure 1: MARS Nepal Survey Camp

1.8 Objectives:

The main objective of survey camp was to develop confidence and mutual co-ordination in students while working in a group of random members. It also focused on training students in such a way that they could work independently for any civil engineering project. In this regard following main works were highlighted:

- To prepare geographical map of an area showing details, contours, etc.
- To use resection and intersection methods to find co-ordinates of unknown station with the help of known stations.
- To learn about the use of Total station.
- To layout building design using Total station and also using 3-4-5 method to set out perpendicular.
- To choose proper road alignment and prepare plan, longitudinal and cross section of road alignment.
- To select appropriate location of bridge axis and prepare longitudinal and cross section as well as topographical map of bridge site.
- To become familiar with the surveying problems that may arise during and after the field works in future.

2. Project Area

2.1 Location and Accessibility

The survey camp was conducted inside MARS Nepal Engineering Survey Camp.The survey camp was carried out with the motive of conducting the survey inside the closed premises for civil engineering students as per the syllabus of course CIEG 210.

The site is expanded over sufficient area of land and is a dedicated survey camp site for civil engineering students so as to enlighten their practical knowledge and experience in fully natural and undulated environment.

The site is accessible by graveled road from the main road locally available at the area.

2.2 Topography and Geology

Lying along the stepped hill topography of MARS Nepal Engineering Survey Camp, with residential housings scattered all over the area and lots of vegetation and crops cultivated over the undulated terrain.

2.3 1.3 Rainfall and Climatic condition

The climatic characteristics are of site are as follows:

- Temperature: 30°C to 16°C in summer
- Max. 17°C to Min.2°C in winter
- Rainfall: 935 mm average annual rainfall.
- Major Crops grown: Paddy, wheat, maize, etc.
- Types of vegetation found: Herbs, shrubs and trees.
- The temperature during the camp period was about 25°C on average

2.4 1.4 Others

MARS Nepal Engineering Survey Camp Pvt. Ltd is located at Lalitpur Metropolitan City, Ward No 22, Bugmati. It's about 35km south east from Kathmandu University, Dhulikhel and 6km far from EkantakunaChakrapath Chowk of Lalitpur (followed by Nakhu, Bhaisepati and Bugamati).

Figure 2: Google image of survey camp site.

3. Topographical Survey

Topographic survey is simply the recording of coordinates and height data for a particular survey area. This data can be used to create spot height maps, contour maps or more complex terrain models of survey area. To understand the form, level, shape and geographic position both of the natural and in unnatural land features, topographic survey is crucial, whether it is a small garden, a highway, a farm, or even a national park. The topographical surveys can probably be the most popular application in establishing the limits of land or property. This survey aims primarily to gather data on the characteristics of the land and its altitude. The result, usually a two- dimensional map of the property, depicts the relative elevation and position of man-made and natural features in a landscape.

3.1 Objectives

The objectives of carrying out Topographical Survey are as follows:

- To prepare the topographical map of the area
- To construct the major traverse, check for errors and adjust them
- To perform detailing of various ground points and details such as trees, roads and the buildings
- To find out the reduced level of various points in order to make contour of the map

3.2 Brief description of area

The area of survey camp lies with inside MARS Nepal Engineering Survey Camp, which is sloppy in nature with decreasing elevation on southern side with undulation, water bodies and lots vegetations. Detail within survey areas are residential housing, road alignment footpath ways, lots of vegetation, water bodies.

3.3 Norms (Technical specification)

All the students at the camp had to work under some norms provided by survey instruction committee. The norms are listed as follows:

- The given work had to be completed within 15 days giving days each for road site and bridge site.
- The proper handling and care of the instrument was the responsibility of the entire group.
- The major traverse had to be fixed in such a way that these points were to be followed:
  i. At least two consecutive stations should be visible from a station.
  ii. Two-way measurement for one traverse leg should be done. The discrepancy should be greater than 1:2000 for major traverse.
  iii. The number of traverse stations should be minimized.
  iv. Two sets of horizontal angles should be taken in major traverse. The difference between the mean angles of two set reading should be within the least count of the theodolite.
  v. The leg ratio of the traverse stations should not be less than 1:2 for major traverse (where the ratio is the ratio of longest length : shortest length)
  vi. All the available checks should be applied to the traverse and adjusted using appropriate method. The angular error must lie within the limit defined by the formula$\mp(LC\sqrt{N})$.

  vii. After the completion of the field work, the plotting of the traverse along with details and the contour lines has to be done thus preparing the topographical map of the worked area.
  viii. Plotting should be done by independent co-ordinate.

3.4 Fly leveling should be done to transfer RL from the BM. The permissible error in the levelling should not be greater than $\pm 25K\sqrt{N}$ mm, where k is the distance in km. All three hair readings should be taken in these cases.

3.5 Equipment

Instruments required during the topographical surveying were:

3.5.1 For reconnaissance

- Ranging rods (3)
- Measuring Tape (1)
- Wooden Pegs (16)
- Hammer (1)
- Marker (1)
- Iron Nail (16)

3.5.2 For Horizontal distance measurement

- Total station (1)
- Tripod (1)
- Prism (2)
- Prism Holder (2)
- Prism Stand (2)
- Measuring Tape (1)

3.5.3 For leveling

- Auto Level and its stand -1
- Leveling staff-1
- Measuring tape-1
- Marker-1

3.5.4 For tacheometer traversing

- Tacheometer with stand -1
- Staff-1
- Ranging rods-2
- Measuring tape -1
- Plumb bob-1
- Compass-1

3.5.5 Detailing with tacheometer

- Tacheometer-1
- Staff-2
- Tape-1
- Calculator-1

3.6 Methodology

3.6.1 Reconnaissance

Reconnaissance or Recce is the extensive study performed in the area to be surveyed to determine the position to place station so that optimum number of stations is achieved. Its purpose is to eliminate those routes or sites that are impractical or infeasible and to identify the better routes of traversing. The visual ideal is taken of the terrain and the feature are noted.

3.6.2 Major Traverse

Traversing is a type of surveying in which a number of connected survey lines form the framework. It is also a method of control surveying. The survey consists of the measurement of

- Angle between successive line and bearing of each line,
- The length of each line.

The direction and the length of the survey line are measured with the help of an angle measuring instrument such as theodolite and a tape. If the co-ordinate of the first station and the bearing of the first line are known, the co-ordinate of all successive point can be computed as follows:

$$\boldsymbol{X_B = X_A + L\,cos}(\emptyset)$$

$$\boldsymbol{Y_B = Y_A + L\,sin}(\emptyset)$$

Where, L = Length of traverse leg

$(\emptyset)$ = *Bearing of AB*

3.6.2.1 Open Traverse

A traverse is said to be an open traverse when it does not form a closed circuit or when it starts and one point and terminates at another point.

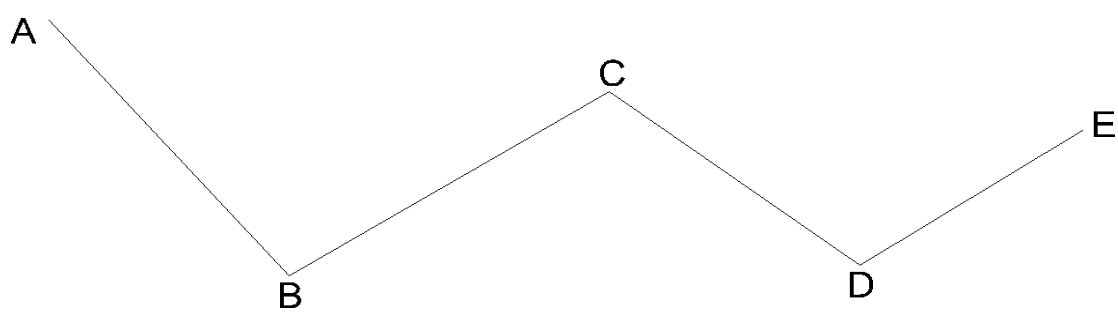

Figure 3: Open Traverse

3.6.2.2 Closed Traverse

A traverse is said to be a closed traverse when starting and terminating point of traverse coincide with each other or when traverse run between two known points.

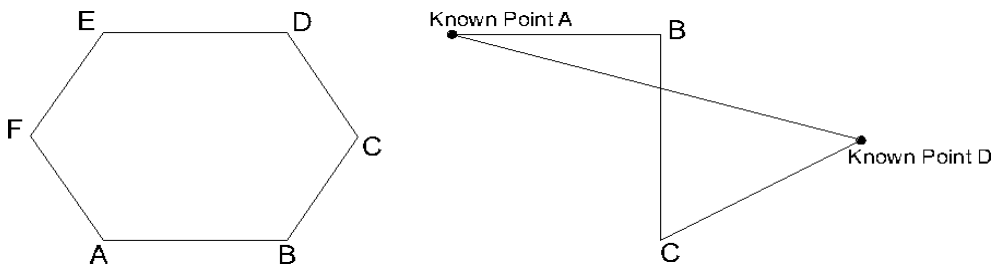

Figure 4: Closed Traverse

The skeleton of lines joining those control points, which covers the whole entire area, is called major traverse. Work on major traverse must be precise. So, two set of reading should be taken for Major Traverse. For convenience, the reading is taken by setting the total station at 0°0'0" for the second.

The major traverse having x control station including two given control points (CP1 and CP2). The control stations are named as XMY where X is the group number and Y is the traverse station number.

The distance of each traverse leg was measured in two ways. The accuracy required was to be greater than 1:2000 with the permissible angular error given by LC√N, where n is the no of traverse station and LC is the least count of the instrument used.

3.6.3 Minor Traverse

It is not sufficient to detail the area by enclosing with the help of major traverse. Minor traverse is the traverse which runs through the area to make detailing easier. Minor traverse covers only a small area. Less precise work than that of major traverse is acceptable so single set reading is sufficient for minor traverses. For the setting out of minor traverse, it should be noted that any one of the major traverse stations should be included with minor stations.

3.6.4 Detailing

Detailing is the process of locating all the required detail point on the ground for the preparation of the topographic map or plan with both horizontal and vertical controls. This was carried out in the field with the help of theodolite.

3.6.5 Leveling

Leveling is a branch of surveying the object of which is:

- To find the elevation of given point with respect of given or assumed datum
- To establish point at a given elevation or at different elevation with respect to a given or assumed datum.

A benchmark some distance away from the survey area was established by a GPS and its reduced level was recorded. The RL of a temporary bench mark (TBM) inside the survey area was determined by method of ordinary/fly leveling from the benchmark. The precision of the work was checked as per the requirement. Then theRL of the temporary benchmark was transferred to the control station of the major traverse. The closing errors was found to be within the permissible limits. The misclosure was adjusted in each leg of the leveling path by using the following formula.

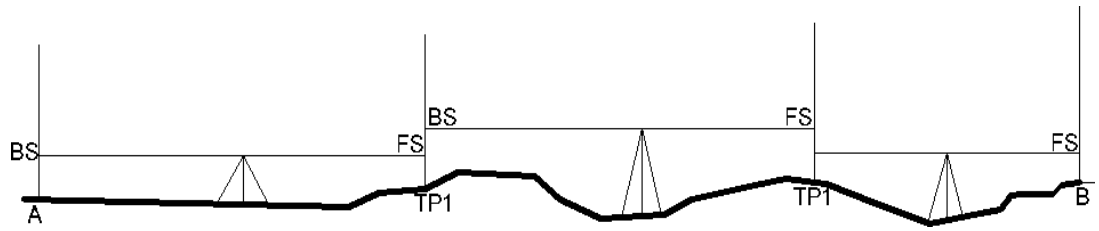

Figure 5: Levelling

$$\boldsymbol{Permissible\ error = \pm 25\ x \sqrt{k}\ mm}$$

where, k is perimeter in Km

$$\boldsymbol{Actual\ Error(e) = \sum BS - \sum FS = Rise - Fall = Last\ R.L - First\ R.L}$$

$$\boldsymbol{Correction\ for\ i^{th}\ leg = Error\ x \frac{L_1 + L_2 + \cdots + L_i}{p}}$$

$$\boldsymbol{Relative\ precision = \frac{1}{\frac{p}{error}}}$$

where, L_1, L_2…, L_i is length of legs and p is perimeter

3.6.6 Computation and plotting

The Traverse was plotted in the scale of 1:600

3.6.7 Comments and conclusion

Major stations were set up over the area on which the survey is based on and coordinates and bearing of the traverse stations and traverse legs respectively were calculated and necessary correction was applied. Minor Traverse stations were not used in our work. Detailing was done after the traverse computation was verified by our instructor. After than contouring was done simultaneously. Topographic map was drawn through the measured data.

4. Total Station

4.1 Description

A total station or total station theodolite is an electronic as well as optical instrument used for surveying and building construction. It's a modern surveying instrument that integrates an electronic theodolite with an electronic distance meter. A theodolite uses movable telescope to measure angles in both horizontal and vertical plane.

Figure 6: Total Station Theodolite

The total station we learned to use on field was TOTAL STATION SPECTRA FOCUS 2.

Total station can measure distances up to an accuracy of 1mm and angle up to an accuracy of 1 second. Using total station, we can measure any length to a maximum of 5 km distance. Microprocessor unit in total station processes the data collected to compute the following data:

- Average of multiple angles measured
- Average of multiple distance measured
- Horizontal distance
- Distance between any two points. Elevation of objects and all the three coordinates of the observed points.

4.2 Advantages of total station

- Field work can be carried out very fast.
- Accuracy of measurement is high.
- Manual errors involved in reading and recording are eliminated.

- Calculation of coordinates is very fast and accurate.

4.3 Task performed during the camp

4.3.1 Finding out the unknown coordinates

- Co-ordinates of two known station was to be provided.
- Coordinates of the station where total station is set up is entered in the total station.
- Co-ordinates of the backward station is set to total station as reference.
- Finally, co-ordinates of unknown stations are determined.

4.3.2 Stake out

- Place the total station in the spot from which you want to stake out points after you have finished entering the coordinates of two unknown stations for the area into the total station's internal memory. Make sure that the total station is level and on secure, even ground before continuing.
- Press the "Power" button to turn on the instrument if it isn't already on. When you see the home screen, press the "S-O" button and use the navigation arrows to move down to the "Stake Out" menu option. Press the "Select" button to enter the stake out menu.
- Select the method that you want to use to stake out the point. Select "XYZ" to stake out by coordinates which will be the most common method.
- Press the "Yes" button to continue the process using the coordinates on the screen for your total station. If the coordinates are incorrect, press the "No" button to try again. In the next screen, use the keypad to enter the coordinates or distances and press the "OK" button to measure. The results will be displayed on the following screen.
- Position the reflector in the point of interest and turn the total station until the horizontal circle reads zero.
- After the horizontal angle readings is aligned, Sight the prism and press measure, then the total station directs whether the point lies in or out of the current point. The prism reflector is moves as necessary and a peg is fixed when the total station verifies the point.

4.4 Conclusion

After the completion of this work we learnt how to find out unknown coordinates of a point in an area and also to locate the point with known co-ordinates in the ground using stake out.

5. Analytical Intersection and Resection

5.1 Intersection

This method is suitable for locating inaccessible points by the intersection of the rays drawn from two instrument stations.

5.1.1 Procedure*:*

Suppose A and B are two stations and P is an object (e.g. tower) on the far bank of a river. Now, it is required to fix the position of the sheet by the intersection of rays, drawn from A and B.

Intersection is resorted to when the distance between the point and the instrument station is either too large or cannot be measured accurately due to some field conditions. The location of an object is determined by sighting at the object from two stations and drawing the rays. The intersection of these rays will give the position of the object. It is therefore very essential to have at least two instrument stations to locate any point. The line joining the two instrument stations isknown as the base line. No linear measurement other than that of the base line is made. The pointof intersection of the two rays from the vertex of a triangle having the two rays as two sides and the base line as the third line of the triangle. Due to this reason, intersection is also sometimes known as graphic triangulation.

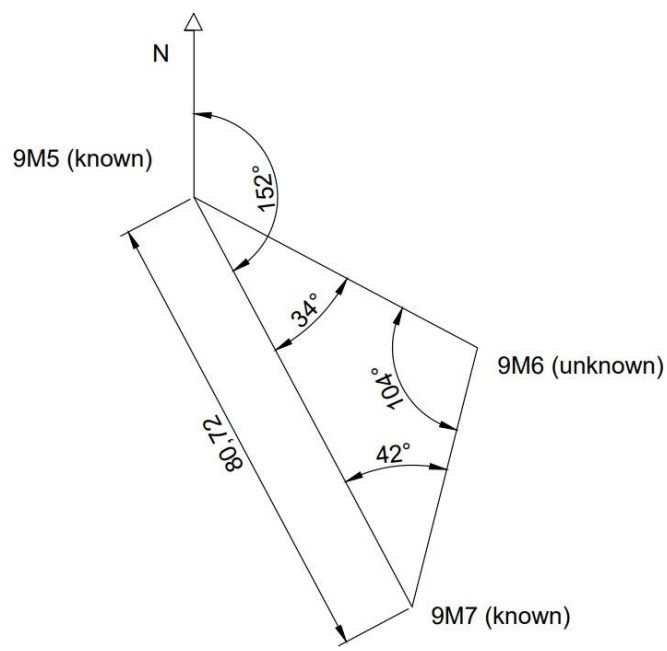

Figure 7:Intersection method of determining co-ordinates of an unknown station

5.1.2 Calculation with Data Acquired on Field

We have,

AC= 80.721, CB = d_1 , AB = d_2

C = 9M7 (0331722.393, 3055660.496)

A = 9M5 (0331688.790, 3055733.890)

AC = $\sqrt{(0331688.790 - 0331722.393)^2 + (3055733.890 - 3055660.496)^2} = 81.721m$

Bearing of AC $= 118°26'11.8"$

We know,

$\alpha = 42°\ 46'\ 4.8''\ \theta$

$= 36°\ 57'\ 46.8''$

From ΔABC,

$\beta = 180°0'0'' - (42°\ 46'4.8'' + 36°\ 57'46.8'') = 100°16'8.4''$

AB (9M5-9M6)= $\frac{\text{Sin}(42°\ 46'\ 4.8'')}{\text{Sin}(100°16^F8.4'')} * 80.721$ = 55.704 m

CB (9M7-9M6) = $\frac{\text{Sin}(\ 36°\ 57'\ 46.8'')}{\text{Sin}(100°16^F8.4'')} * 80.721$ = 49.328m

From C(9M7):

$Bearing\ of\ CB = 18°10'34"$

$Latitude\ of\ CB = CB \times Cos(18°10'34") = 46.866m$

$Departure\ of\ CB = CB \times Sin(18°10'34") = 15.387m$

$Northing\ of\ B = Northinh\ of\ C + Latitude\ of\ CB$

$= 3055660.496 + 46.866$

$= 3055707.362m$

$Easting\ of\ B = Easting\ of\ C + Departure\ of\ CB$

$= 0331722.393 + 15.387$

$= 0331737.78m$

Zenithal angle = $89°33'00''$

RL of B= RL of C + HI at C + BC× Tan(90-$89°33'00''$) -height of target

= 1254.848 + 1.426+ 55.704 × Tan($90°0'0'' - 89°33'00''$)-1 = 1255.711 m

From A (9M5):

$Bearing\ of\ AB = Bearing\ of\ AC - 36°57'46.8''$

$= S24°36'1.4''E - 36°57'46.8''$

$= 155°23'58.6" - 36°57'46.8''$

$= 118°26'11.8"$

$Latitude\ of\ AB = AB\ \times\ Cos(\ 118°26'11.8") \ =\ -26.525m$

$Departure\ of\ AB = AB\ \times\ Sin(118°26'11.8") \ =\ 48.983m$

$Northing\ of\ B = Northing\ of\ A\ + Latitude\ of\ AB$

$= \ 3055733.890 - 26.525$

$= 3055707.365m$

$Easting\ of\ B\ \ = Easting\ of\ A\ + Departure\ of\ AB$

$= 0331688.790 + 48.983$

$= 0331737.773m$

Zenithal Angle = $89°33'00''$

RL of B = RL of A + HI at A+ AB × Tan(90-$89°33'00''$) -height of target

= 1253.433 + 1.372 + 49.328 × Tan($90°0'0'' - 89°33'00''$)-3= 1255.803 m

At Average:

Co-ordinates of B = (0331737773,3055707.365)

RL of B = 1255.757 m

5.2 Resection (Three-Point)

The method of resection is used to determine the coordinates of an unknown station from three known stations. The known stations should be selected such that they all lie opposite side to the unknown station. Ranging rods, each of height r, are placed on the known stations.

5.2.1 Steps of Analytical Resection

1. The reduced bearing of traverse leg BA is calculated as, RB (AB) $= \frac{X1-X2}{Y1-Y2}$ and the reduced bearing of traverse leg B-C is calculated as, RB (BC) $= \frac{X3-X2}{Y3-Y2}$
2. Then, angle z = WCB of BA – WCB of BC
3. With instrument at P, the horizontal angle α, the zenithal angle between stations P and A, V_{PA}, the zenithal angle between stations P and B, $V_{PB,}$ the horizontal angle β, and the zenithal angle between stations P and C, $V_{PC,}$ are measured setting 0º0'0'' at A and B respectively.
4. The height of instrument at P, $HI_{P,}$ is measured.
5. In quadrilateral PABC, α + β + x + y + z = 360º

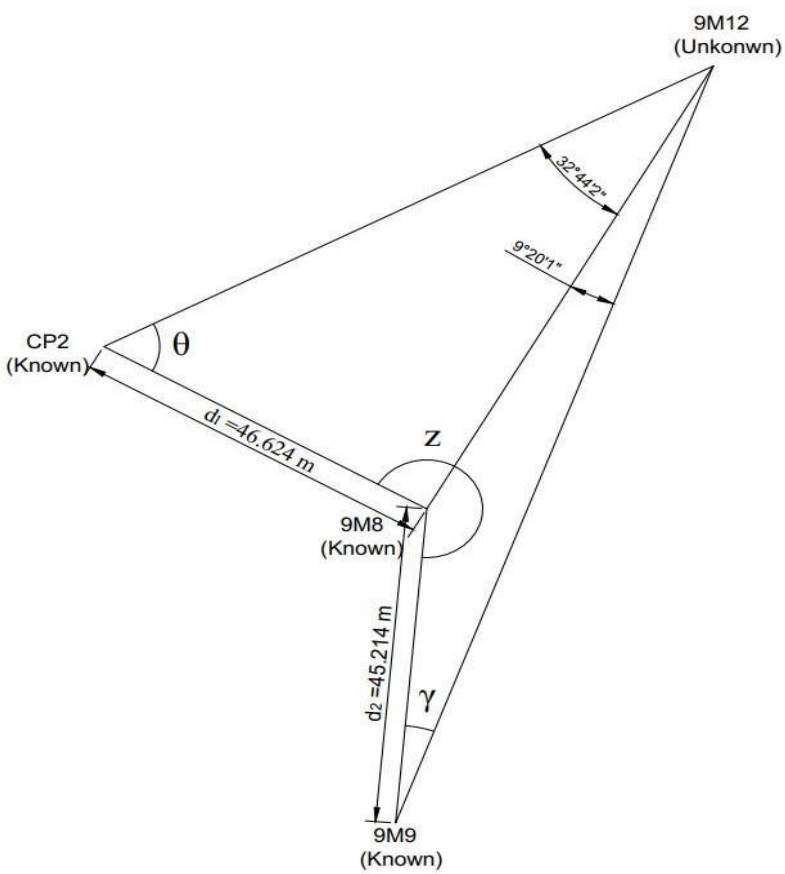

Figure 8: Resection

6.

Or, $x + y = 360^{o} - \alpha - \beta - z = \phi$..... (1)

7. The distance AB is calculated as AB = $\sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$ and the distance BC is calculated as BC = $\sqrt{(X_3 - X_2)^2 + (Y_3 - Y_2)^2}$.
8. In Δ PAB and in Δ PBC,

$\frac{BP}{\text{Sin } x} = \frac{AB}{\text{Sin } \alpha}$ …….. (2) and $\frac{BP}{\text{Sin } y} = \frac{BC}{\text{Sin } \beta}$ ……(3)

Or, $\frac{\text{Sin } x}{\text{Sin } (\phi - x)} = \frac{BC * \text{Sin } \alpha}{AB * \text{Sin } \beta}$

Or, x=……..

From (1), y = ……..

9. Using sine law, the distances AP, BP and CP are calculated.
10. WCB of AP = WCB of line AB + x; WCB of CP = WCB of CB –y
11. WCB of PB =WCB of AP + α ± 180º
12. From A, the (X, Y) coordinates of P = [X_1 + AP*Sin (WCB of AP), Y_1 +AP*Cos(WCB of AP)]
13. From B, the (X, Y) coordinates of P = [X_2 + BP*Sin (WCB of BP)), Y_2 + BP*Cos(WCB of BP)]
14. From C, the coordinates of P = [X_3 + CP*Sin (WCB of CP)), Y_3 + CP*Cos(WCB of CP))]
15. From A, the Z-coordinate of P = Z_1 + r ± AP*tan(90º - V_{PA}) – HI_P [- if V_{PA} <90º]
16. From B, the Z-coordinate of P = Z_2 + r ± BP*tan(90º - V_{PB}) – HI_P [- if V_{PB} <90º]
17. From C, the Z-coordinate of P = Z_3 + r ± CP*tan(90º - V_{PC}) – HI_P [- if V_{PC} <90º]
18. The coordinates of P(X_4, Y_4, Z_4) are average of the coordinates of P from A, B and C.

5.2.2 Calculation with Data Acquired on Field

We have,

$A = CP2 = (331724.100, 3055626.011)$

$B = 9M8 = (331764.505, 3055602.746)$

$C = 9M9 = (331760.603, 3055557.701)$

$D = 9M10 = ?$

$$AB = \sqrt{(3055602.746 - 3055626.011)^2 + (331764.505 - 331724.100)^2} = 46.624m$$

$$BC = \sqrt{(3055557.701 - 3055602.746)^2 + (331760.603 - 331764.505)^2}$$

$= 45.214m$

$$Bearing\ of\ AB = Tan^{-1}\left(\frac{331764.505 - 331724.100}{305560.746 - 3055626.011}\right)$$
$$= 119°55'58.8''$$

$$Bearing\ of\ BC = Tan^{-1}\left(\frac{331760.603 - 331764.505}{3055557.701 - 3055602.746}\right)$$
$$= 184°57'2.88''$$

Observed measurements,

$\alpha = 32°49'58.8''$

$\beta = 9°19'58.8''$

$Zenithal\ Angle\ at\ station\ A = 92°4'47''$

$Zenithal\ Angle\ at\ station\ B = 91°40'43''$

$Zenithal\ Angle\ at\ station\ C = 91°2'37''$

Now, for internal angles,

From the figure,

$\gamma + \theta = 360 - (\alpha + \beta + z)$

Where,

$z = (360° - Bearing\ of\ BA) - Bearing\ of\ BC$

$= (360° - 119°55'58.8'' - 180°) - 184°57'2.88''$

$= 245°1'4.08''$

Then, if $\gamma + \theta = k$,

$k = 360°0'0'' - (32°49'58.8'' + 9°19'58.8'' + 245°1'4.08'') = 72°54'58.32''$

Now,

In Δ ABD and in Δ BCD,

$$\frac{BD}{Sin\ \theta} = \frac{AB}{Sin\ \alpha}\ and\ \frac{BD}{Sin\ \gamma} = \frac{BC}{Sin\ \beta}$$

From above,

$$BD = \frac{\sin\theta}{\sin\alpha} \times AB \quad ---------- (1)$$

$$BD = \frac{\sin\gamma}{\sin\beta} \times BC \quad ---------- (2)$$

From eqn (1) and eqn(2)

$$\frac{\sin\theta}{\sin\alpha} \times AB = \frac{\sin\gamma}{\sin\beta} \times BC$$

$$\frac{\sin\theta}{\sin\gamma} = \frac{\sin\alpha}{\sin\beta} \times \frac{BC}{AB}$$

$\sin\theta$ $\quad \frac{\sin\ 32°43'58.8''}{}$ $\quad \frac{45.214}{}$

$$\frac{}{sin(\,72°54'58.32" - \theta)} = \quad sin\ 9°19'58.8'' \ \times 46.624$$

$$\theta = 57°45'5.03''$$

$\theta = 57°45'5.03''$

$And, \gamma = 15°9'53.29''$

$Also,$

$\measuredangle ABD = 180°0'0'' - (\alpha + \gamma) = 89°24'56.17''$

$$\frac{AD}{Sin\measuredangle ABD} = \frac{AB}{Sin\ \alpha}$$

$$AD = d3 = AB \frac{Sin\measuredangle ABD}{Sin\ \alpha} = 46.624 \frac{Sin(89°24'56.17)}{Sin(32°43'58.8'')} = 86.221m$$

$Similarly,$

$\measuredangle DBC = 180°0'0'' - (\gamma + \theta) = 155°30'7.91''$

$$\frac{CP}{Sin\measuredangle CBP} = \frac{BC}{Sin\beta}$$

$$CD = d4 = BC \frac{Sin\ \measuredangle DBC}{Sin\ \beta} = 45.214 \frac{Sin(155°30'7.91'')}{Sin(9°19'58.8'')} = 115.592m$$

$And,$

$$d5 = \frac{Sin\ \gamma}{Sin\ \beta} * d2 = \frac{Sin(15°9'53.29'')}{Sin(9°19'58.8'')} \times 45.214 = 72.924m$$

$From\ A\ (CP2)$:

$Bearing\ of\ AD = Bearing\ of\ AB - \theta = 119°55'58.8'' - 57°45'5.03'' = 62°10'53.77''$

$Latitude\ of\ AD = AD \times Cos\ (62°10'53.77'') = 40.236m$

$Departure\ of\ AD = AD \times Sin\ (62°10'53.77'' = 76.255m$

$RL\ of\ D = RL\ of\ A - HI\ at\ D - AD \times Tan\ (Vertical\ Angle) + height\ of\ target$

$= 1253.421 - 1.492 + 86.221 \times Tan\ (2°4'47'') + 1$

$= 1256.060m$

$D = (E_A + D_{AD}, N_A + L_{AD}, RL\ of\ D)$

$= (0331800.357, 3055666.248, 1256.060)$

$From\ C\ (9M9)$:

$Bearing\ of\ CD = Bearing\ of\ CB + \gamma = 20°6'56.17''$

$Latitude\ of\ CD = CD \times Cos\ (20°6'56.17'') = 108.541m$

$Departure\ of\ CD = CD \times Sin\ (20°6'56.17'') = 39.753m$

$RL\ of\ D = RL\ of\ C - HI\ at\ D + CD \times Tan\ (Vertical\ Angle) + height\ of\ target$

$= 1252.750 - 1.492 + 115.592 \times Tan\ (1°2'37.2'') + 3$

$= 1256.363m$

$D = (E_C + D_{AD}, N_C + L_{CD}, RL\ of\ D)$

$= (0331800.356, 3055666.242, 1256.363)$

$From\ B\ (9M8)$:
$Bearing\ of\ BD = Bearing\ of\ BC - \measuredangle DBC = 29°26'54.97''$
$Latitude\ of\ BD = BD \times Cos\ (29°26'54.97'') = 63.502m$
$Departure\ of\ BD = BD \times Sin\ (29°26'54.97'') = 35.852m$
$D = (E_B + D_{BD}, N_B + L_{BD}, RL\ of\ D)$
$= (0331800.357, 3055666.248, 1256.275)$

$RL\ of\ D = RL\ of\ B - HI\ at\ D + BD \times Tan\ (Vertical\ Angle) + height\ of\ target$
$= 1252.633 - 1.492 + 72.924 \times Tan\ (1°40'43'') + 3$
$= 1256.275m$
$Then, at\ an\ average,$
$D = (0331800.357, 3055666.246, 1256.232)$
$Actual\ Coordinates\ of\ D\ (9M12) = (0331800.236, 3055666.172, 1256.232)$

6. Layout of Building

The process of laying out (or setting out) a building or a structure is an important part of surveying, as it enables the works to proceed on site exactly according to prepared designs. Building layout was done by two methods:

i. Using Total station
ii. Using tape

6.1 Brief Description of Layout

Building layout is set according to foundation plan drawings and specifications provided as per the engineering drawing. The purpose of setting out is to transfer the plan, length and width of its foundation on the ground so that the foundation can be excavated for construction of purposed building as per drawing. The provided plan of building to be laid out was 18’*26’3’’.

6.2 Norms

- Laying out should be started with the longest side first.
- Minimum of 2.5 feet lengths should be left out on each side of the rectangular plan.
- 3-4-5 method should be used to lay out perpendiculars to any line.
- While using total station stake-out is to be done to locate the points on the ground directly using co-ordinates of two known points.
- The center-to-center distances between the proposed walls should be marked

- The diagonals of the layout should be measured to cross-check for the errors.

6.3 Location and Site Plan

The site for building layout was located on the plain area of under construction road outside the premises of MARS Nepal Survey Camp. The layout was carried out on avery gently sloped ground. A drawing of building was provided to us whose layout was to be drawn.

6.4 Equipment

- Pegs
- Masonry rope
- Measuring tape
- Nails
- Hammer

6.5 Methodology

- A base line was set out first by choosing the longer side of the outer wall.
- By leaving 5ft offset on both sides from the center of column pegs were fixed and masonry rope was tied tightly on the nails at the top of pegs.
- Using 3-4-5 method a perpendicular offset from the base line was set out and pegs were fixed at necessary distance.
- The theoretical and practical hypotenuse length were compared to check the accuracy of the perpendicular offset and repeated until its free from errors.
- Similarly outer rectangular plan was first plotted on the ground and then the inner rectangles were plotted and check simultaneously to check the accuracy of work.
- In this way the plan of the building layout was plotted on the ground.

6.5.1 Site Selection

Ground with stable mass, intact soil and fairly levelled was selected.

Figure 9: Building layout

6.5.2 Topographical Survey

The site for laying out the building was selected, was fairly levelled.

6.5.3 Determination of Area

The theoretical area occupied by the building was already known from the map of the plan. Also, the area at the site was found out by measuring the actual dimensions and it was made sure that the area was equal to the theoretical area.

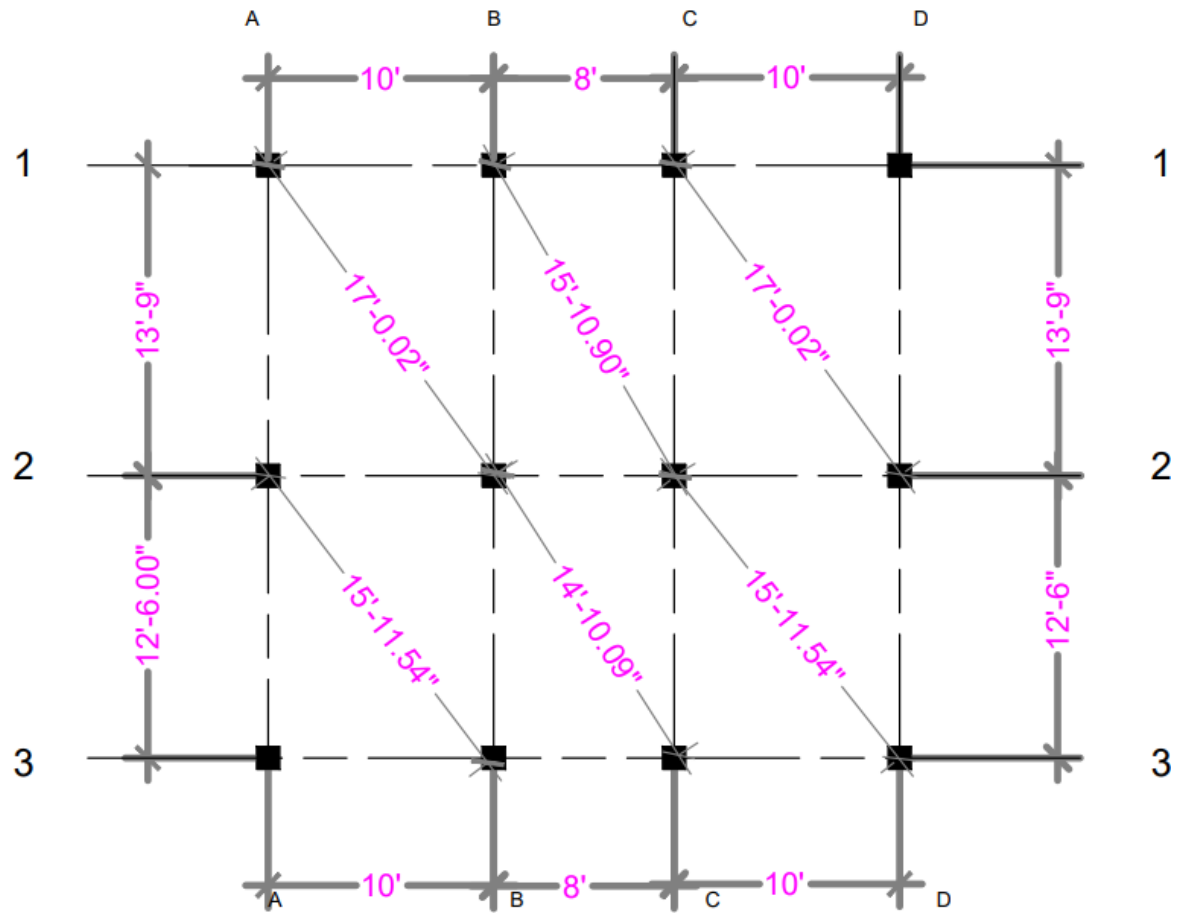

Figure 10:Plan of building layout

6.5.4 Steps of Layout

The following procedure was followed in order to make the layout of the building:

❖ Using Tape

- A peg was hammered into the ground to mark one of the edges of the area.
- The various dimensions were measured and pegs were inserted into the ground starting from the external edges of the ground.
- Nail was hammered on the top and center of the peg.
- Thread was tied on the nail of the hammer and the pegs were tied by the same thread thereby giving the exact layout of the building.
- 3 4 5 method was applied to create perpendicular line and corners.

❖ Using Total station

- Total station was set up on a station with known co-ordinates.
- From the station another known station having known co-ordinates was back-sighted.

- Co-ordinates of these two known stations were entered in data of total station.
- Independent coordinates of all the columns were calculated and every point was located on the ground using stake-out.

6.6 Comments and Conclusion

The excavation and cutting-filling process can be carried out in the proposed site with the help of building layout.

7. Bridge site survey

Bridges are the structured that are constructed with the purpose of connecting two places separated by deep valleys or gorges or rivers and streams. Bridges are usually a part of road making them shorter and hence economical. In countries like Nepal, where the land is undulated and where there are plenty of rivers, bridges are the most economical and efficient way to join two places.

The aim of bridge site survey is to obtain preliminary knowledge of selection and planning of possible bridge site and its axis.

Points that should be taken under consideration while selecting bridges axis are: -

- Narrow and stable banks
- Straight channel
- Longitudinal gradient of river
- Stable downstream and upstream site and
- Perpendicular to flow direction

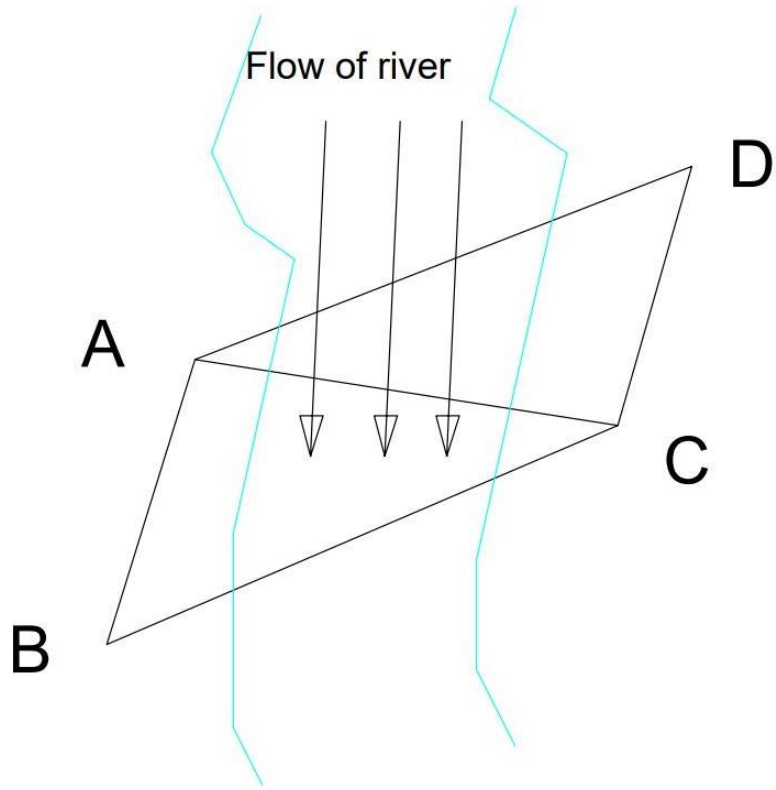

Figure 11: Using Triangulation method to determine length of bridge axis.

7.1 Objectives

i. To select suitable location for the construction of bridge.
ii. To determine the span of the bridge by triangulation.
iii. Perform Survey both upstream and downstream of the proposed bridge axis.
iv. To plot the contour map around that location.

7.2 Brief description of the area

Bridge site survey was carried out over the gorge situated near the survey camp location. The area was covered with lots of vegetation, trees, shrubs. It was a gorge between two hills with local catchment and having runoff only in rainy season. The flow direction seemed to be from northeast to southwest. The depth of gorge ranged from 3-5m between the proposed bridge abutments. During our survey we couldn't see any marks lefts by high water level and only a small canal was running from upstream towards downstream.

7.3 Hydrology, geology and soil

The site is surrounded with sloppy ground and with no road accessible but foot trails connecting two sides. The area is covered with dense vegetation and the width of gorge was about 50 meters. There was no presence of water marks on the rocks. The average annual precipitation is 935mm.

7.4 Norms (Technical Specification)

The following norms were followed while performing the bridge site survey in the field:

- Control point fixing as well as determining the length of the bridge axis had to be done by the method of triangulation. While forming triangles, proper care had to be taken such that the triangles were well conditioned i.e., none of the angle of the triangle were greater than 120° or less than 30°.
- Computed mean length of bridge axis from base triangle should be greater than 1:2000.
- Transforming the level from one bank to another bank had to be done by the method of reciprocal leveling.

7.5 Equipment

- Theodolite
- Total station
- Auto Level
- Tripod stand
- Leveling staff
- Ranging rod
- Pegs and Hammer
- Tape

7.6Methodology

7.6.1 Site selection

Following things were considered while selecting the bridge site: -

- The rock abutments were studied and made sure that they were strong enough to support the bridge and the dead as well as live loads and the site was found suitable.
- The bridge axis should be located in such a way that it should be fairly perpendicular to the flow direction and at the same time, the river width should be narrow concerning the economical point of view.
- The location of the bridge was selected in such a way that the height of the roads joined by the proposed bridge were almost the same. This prevented a lotof cutting and filling to maintain a gentle gradient.

- The high flood level of the river was studied and hence the height of the bridge above the river was designed taking into consideration the occasional flooding.
- The bridge was chosen at such a place that it was very convenient for the local use. And the bridge doesn't deviate from the currently used pathway. Hence its use is predicted to be huge thus providing service to a large number of the local people.

7.6.2 Topographical Survey

Topographic survey is simply the recording of coordinates and height data for a particular survey area. This data can be used to create spot height maps, contour maps, or more complex terrain models of the surveyed area. To understand the form, level, shape and geographic position both of the natural and in unnatural land features, topographic survey is crucial, whether it is a small garden, a highway, a farm, or even a national park. The topographical surveys can probably be the most popular application in establishing the limits of land or property. This survey aims primarily to gather data on the characteristics of the land and its altitude. The result, usually a two-dimensional map of the property, depicts the relative elevation and position of man-made and natural features in a landscape.

During our project, the triangulations and its angle measurement were done by using theodolite. The obtained length of bridge axis from triangulation was compared from both triangles and if they are withing permissible limit of error, theywere then verified by using Total station.

The detailing of points to create the contour, cross-section and L section were taken using total station.

7.6.3 Longitudinal section and cross section.

Longitudinal sectioning is the process of determining the elevations of the points at the short-measured intervals along a fix line or alignment such as the center line of the railway, highway, canal or sewer. The fixed line may be a single straight line or it may be composed of a succession of straight lines or of a series of straight lines connected by curves. It requires the establishment of turning points on which both back and fore sights is taken. In addition, any number of intermediate sights may be taken on the points along the line from each set up of the instrument. It is generally best to set up the instrument to one side of the profile line to avoid too short sights on the points near the instrument. For each set up, intermediate sights should be taken after the fore sight on the next turning point has been taken. The position of the intermediate points on the profile is simultaneously located by chaining along the profile and noting their distances from the point of commencement.

L section was plotted in graph of scale 1:500 along x axis and 1:100 along y axis. Cross section was plotted in graph of scale 1:200 along x axis and 1:100 along y axis.

7.6.4 Leveling

Level transfer was done in three steps first RL was transferred from the given B.M to a point on bridge axis by fly leveling, then with the help of reciprocal leveling, level was transferred to another axis point and finally RL was transferred to all other control points. The RL of the given BM was 1287.

7.6.5 Reciprocal Leveling

Surveying method between two points at great distances, where height measurements are taken at both directions to eliminate possible atmospheric and curvature errors. In reciprocal levelling, the level is set up on both bank of the river or valley and two sets of staff reading is taken by holding the staff on both banks in this case it is found that error is completely eliminated and true difference of level is equal to the mean of the two apparent differences of level.

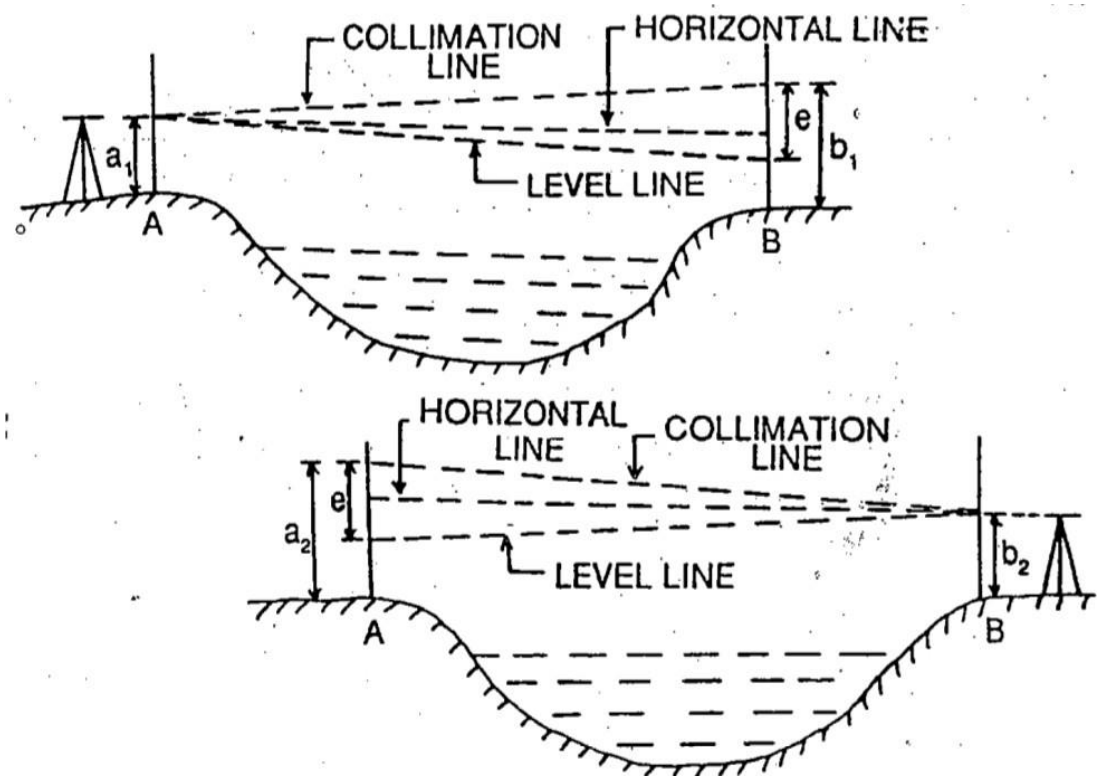

Figure 12: Reciprocal Levelling

7.6.6 Detailing

Detailing is the process of locating all the required detail point on the ground for the preparation of the topographic map or plan with both horizontal and vertical controls. This was carried out in the field with the help of theodolite. First of all, bridge axis station was fixed followed by triangulation stations. Well-conditioned triangles were established to take the necessary data for detailing.

7.6.7 Computation and plotting

Firstly, the horizontal and vertical control of triangulation stations was determined. Then, other stations were manipulated to horizontal and vertical control. Bearing of the bridge axis was measured and the coordinate of a bridge axis point was taken to move onto further calculation. And the calculation was further proceeded as usual along with the checking. Then the coordinates were calculated.

1.1.1 Computation and Plotting

The following tachometric formulas were used for the calculation of the horizontal distance and R.L. of different points.

$Horizontal\ distance\ of\ any\ point\ from\ the\ traverse\ station, D = 100\ x\ S\ x\ (cos^2\theta)$

$Where,$

$S = Staff\ intercept\ = Top\ -\ Bottom\ stadia\ reading$

$\theta = Vertical\ Angle$

$And\ RL\ of\ detail = RL\ of\ station\ +\ HI\ \pm\ V -\ Central\ stadia\ reading$

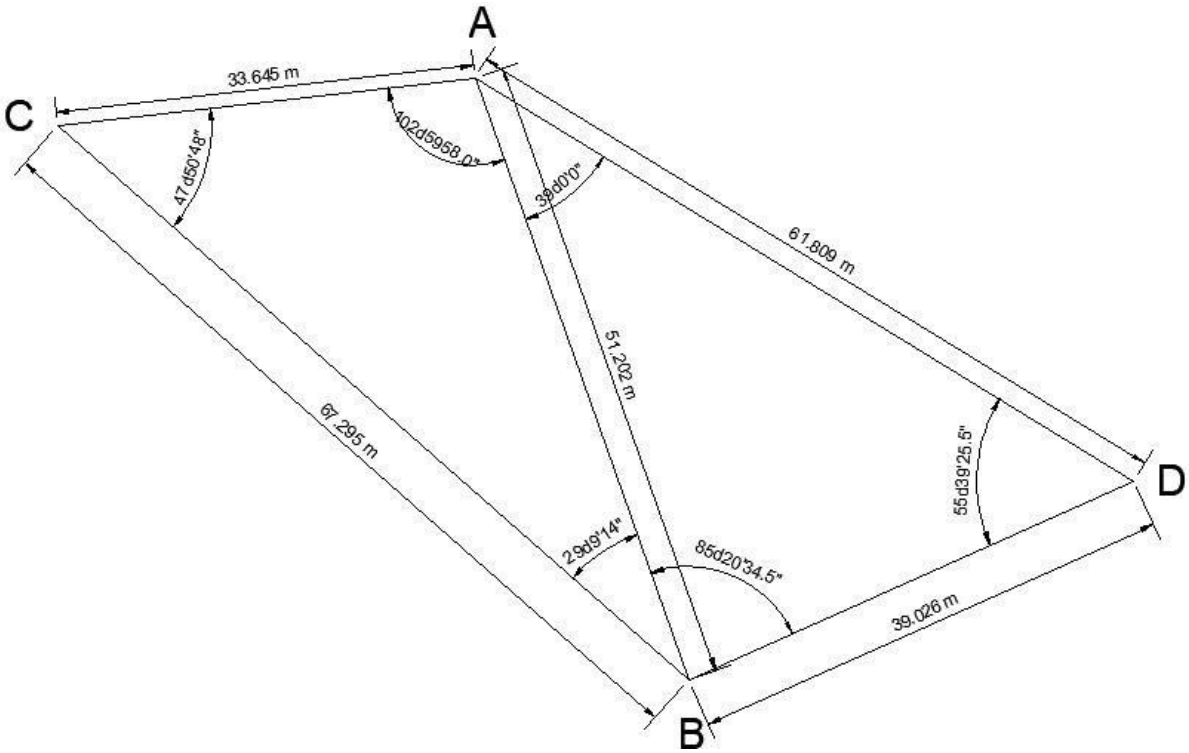

Figure 13: Triangulation Plot for Bridge Survey

$For\ leg\ AC$
$Forward\ distance = 33.639\ m$
$Backward\ distance = 33.651m$
$Average\ distance = 33.645\ m$

$For\ leg\ BD$
$Forward\ distance = 39.028m$
$Backward\ distance = 39.024$
$Average\ distance = 39.026m$

$\measuredangle\ ABC =\ 29°9'12"$
$\measuredangle\ BAC =\ 102°59'58"$
$\measuredangle\ ACB =\ 47°50'48"$
$\measuredangle\ BAD =\ 39°0'0"$
$\measuredangle\ ADB\ =\ 55°39'25.5"$
$\measuredangle\ ABD\ =\ 85°20'34.5"$

$In\ triangle\ ABC$
$Using\ sine\ law\ we\ get,$
$BA = 51.204$

$BC = 67.295$

$In\ triangle\ ABD$
$Using\ sine\ law\ we\ get$
$BA = 51.200$
DA = 61.809

Average length of BA= 51.202, where BA is the proposed bridge axis

For reciprocal leveling,

$From\ first\ figure,$
$a1 = 1.328$
$b1 = 3.204$

$From\ second\ figure,$
$a2 = 0.120$
$b2 = 2.027$

$We\ know,$

$$\frac{(b1 - a1) + (b2 - a2)}{2} = D$$

$From\ above\ equation,$
$Elevation\ difference, D = 1.8915m$
$i.e.\ A\ is\ higher\ than\ B\ by\ 1.8915m$

$By\ fly\ leveling\ from\ B.M., we\ get;$

$RL\ of\ A = 1285.010m$
$RL\ of\ B = 1283.118m$

The XYZ coordinates of each of the station is tabulated below in the list of tables section.

Station	Easting, m	Northing, m	R.L,m
A	0332098.348	3055815.045	185.010
B	0332115.439	3055766.780	1283.118
C	0332064.919	3055811.236	1285.625
D	0332151.049	3055782.750	1287.338

7.7 Comments and conclusion

During the selection of the site all the considerations like geological, socio-economical and topographical considerations were made and the best site was selected. The inspection of thearea showed that no sprigs, streams, and sewer were discharge into the rivers up to the 80m

downstream and 100m up stream. The detailing task was quite difficult for us as there was vertical cliff. As we successfully implemented our surveying knowledge for bridge site survey, we gained high confidence level to work in our professional field.

8 Road Alignment and Geometry Design

Road construction is an important aspect in the development of transportation network. The length of the road surveyed was about 800 meters. All the cross sections as well as longitudinal section data were taken at the chainage of 20 meter and at each commencement point, apex and each tangent point.

8.1 Brief Description of the Project Area

The project area for the conducting a road site survey was in the site of currently under construction Nijgadh-Kathmandu Fast track just outside of the camp site, Bungamanti, Lalitpur.

Figure 14 : Road site Survey

8.2 Hydrology, Geology and Soil

Geology and hydrology directly have impact on road design. The design of drainage, back slope cut and design of retaining wall is done considering a geology and hydrology of a site. The land was undulated with no large boulders or rocks of any kind along the proposed site.

The soil is compacted and uniform throughout the whole length of the road. Sandy and hard clayey soil were found along the road course.

8.3 Norms (Technical Specification)

Carry out the reconnaissance survey for the selection of road alignment considering the following factors:

- Stable ground
- Permissible gradient (according to NRS *i.e. MIN of 1% to MAX of 12%*)
- Geometry of road (according to NRS)
- Making use of existing road or track
- Inter-visibility between intersection point (I.P)
- Obligatory points (Positive and Negative).
- Optimum use by public.
- Minimum road length as far as possible
- Economic condition of project

1) Establish a B.M. near starting point of road and observe the bearing of the first line.
2) Observe the deflection angle at each IP and assume the radius of the curve according to NRS. Then set out a curve by computing tangent length, curve length, apex distances and chainage of B.C., M.C. and E.C. Permissible error of closure for levelling must not be greater than ±25 √k mm.
3) Determine R.L. of road center line at 20 m interval. Close the leveling work by fly leveling and check the accuracy of the job.
4) The gradient of the road had to be maintained below 12 % and up to minimum of 1%.
5) The radius of the curve had to be chosen such that it was convenient and safe. The radius of the curve should not be less than 15m.It should be noted that while choosing the radius and determining tangent length, the back tangent of one curve shouldn't overlap with the forward tangent of next curve.
6) Subsequent reverse curves in road alignment should be avoided.
7) Prepare the topographic map (scale of 1:1400) of road corridor showing geometric curve, road formation width, right of way, crossing, etc. Draw L-profile (scale: 1:700 along x-axis and 1:100 along y-axis) and cross-section of road in scale (scale: 1:200 along x axis and 1:100 along y axis.)

8.4 Equipment

- Tacheometer with stand-1
- Staff-2
- Ranging rods-3
- Measuring tape-1
- Pegs
- Hammer-1
- Marker-1
- Level-1
- Plumb bob-1
- Compass-1

8.5 Methodology

The alignment of road includes several ways and procedures that need to be carried out are listed below:

8.5.1 Horizontal Alignment

Horizontal alignment is done for fixing the road direction in horizontal plane. For this, the bearing of initial line connecting two initial stations was measured using compass. The interior angles were observed using tacheometer at each IP and then deflection angles were calculated as

$$Deflection\ angle = 180° - Observed\ angle$$

If the deflection angle is positive, the deflection is towards right and if the deflection angle is negative, the deflection i
s towards the left. The radius was assumed according to the deflection angle. Then the tangent length, beginning of the Curve (BC), End of the Curve (EC), apex distance along with their chainage were found by using the following formulae,

$$Tangent\ length(\frac{\Delta}{2}) = R * Tan$$

$$Length\ of\ curve\ (L.C.) = \frac{\pi R\Delta}{180°}$$

$$Apex\ Distance = R * \frac{1}{Cos\frac{\Delta}{2} - 1}$$

- Apex distance = R * (1/ (Cos (Δ /2)-1)
- Chainage of BC = Chainage of IP – T
- Chainage of MC = Chainage of BC +LC/2
- Chainage of EC = Chainage of MC + LC/2

= Chainage of BC + LC

The BC and EC points were located along the line by measuring the tangent length from the apex and the points were marked distinctly. The radius was chosen such that the tangent does not overlap. The apex was fixed at the length of apex distance from IP along the line bisecting the interior angle.

8.5.2 Vertical Alignment

Vertical profile of the road alignment is known by the vertical alignment. In the L-section of the Road alignment, vertical alignment was plotted with maximum gradient of 12 %. According to NRS, gradient of the Road cannot be taken more than 12 %. In the vertical alignment, we set the vertical curve with proper design. Vertical curve may be either summit curve or valley curve. While setting the vertical alignment, it should be kept in mind whether cutting and filling were balanced or not. This also gives us the information about the rough quantity of cutting or filling that might be required in the process of the construction of the road.

8.5.3 Levelling

The method of fly levelling was applied in transferring the level from the given B.M. to all the I.Ps, beginnings, mid points and ends of the curves as well as to the points along the center line of the road where the cross sections were taken. After completing the work of fly leveling on the entire length of the road, check leveling was continued back to the B.M. making a closed loop for check and adjustment. The permissible error for RL difference is $25\sqrt{k}$ mm, where k is the loop distance in km.

8.5.4 Longitudinal Section

The L-section of the road is required to the road engineer an idea about the nature of the ground and the variation in the elevation of the different points along the length of the road and also to determine the amount of cutting and filling required at the road site for maintaining a gentle slope. In order to obtain the data for L-Section, Staff reading was taken at a point at 20m intervals along the central line of the road with the help of a level by the method of fly leveling. And thus, after performing the necessary calculation the level was transferred to all those point with respect R.L. of the given B.M. Then finally the L-Section of the road was plotted on a graphpaper on a vertical scale of 1:100 and a horizontal scale of 1:1000.

8.5.5 Cross Section

R.L transferred perpendicular to the path of survey or road alignment is the Cross section. This Is done to cover the width of road from central line (Longitudinal) towards the flanks of the road. All in all, cross section data assists in creating an inclined plane by informing cut-fill operations necessary perpendicular to any point along center-line.

8.5.6 Topographical survey of road corridor

Topographical surveying helps accurately determine the terrestrial or three-dimensional space position of points and the distances and angles between them, using levelling instruments such as theodolites, dumpy levels and clinometers. A topographical survey is a large-scale project that is executed only a proficient topographical surveyor. A road design includes many important factors, like the length and breadth of the road, in addition to the purpose of usage of the road. Foreasy determination of the best materials and techniques for the construction of any specific project, final report from topographical surveyors is taken into account, as it contains comprehensive insight about every minute detail related to that project.

A topographical survey is indeed a necessity, and with all the technological advancements, such as innovative digital tools and 3D maps, it has become quicker and more accurate than ever.

8.6 Comments Conclusion

Survey of the road alignment is done to make safe, easy, short and economical road. Geological stability and soil stability are also taken into account. Vertical and horizontal curves are set according to Road Design Standards for comfort and other factors.

While setting the road alignment, it should be kept in mind that the minimum IP points should be taken as far as possible and deflection angles should be minimal as far as possible.

Appendix

Tables

Table 1: Distance measurement sheet

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey camp, 2022

Observer:	Group 9	Date:	15-Aug-22
Recorder:	Group 9	Weather:	Sunny
Instrument:	Total station	Temperature:	29°C

Distance Measurement Sheet

S.N	Traverse leg	Distance (m)		Discrepancy	Average Distance, m	Precision 1:	Remarks
		Forward	Backward				
1	CP 1 - 9M 1	38.213	38.225	0.012	38.219	3184.917	Within Precision
2	9M 1 - 9M 2	55.727	55.726	0.001	55.727	55726.500	Within Precision
3	9M 2 - 9M 3	47.858	47.842	0.016	47.850	2990.625	Within Precision
4	9M 3 - 9M 4	45.978	45.961	0.017	45.970	2704.088	Within Precision
5	9M 4 - 9M 5	35.887	35.901	0.014	35.894	2563.857	Within Precision
6	9M 5 - 9M 6	55.573	55.546	0.027	55.560	2057.759	Within Precision
7	9M 6 - 9M 7	49.371	49.358	0.013	49.365	3797.269	Within Precision
8	9M 7 - CP 2	34.524	34.526	0.002	34.525	17262.500	Within Precision
9	CP 2 - 9M 8	46.614	46.597	0.017	46.606	2741.500	Within Precision
10	9M 8 - 9M 9	45.221	45.206	0.015	45.214	3014.233	Within Precision
11	9M 9 - 9M 10	64.185	64.160	0.025	64.173	2566.900	Within Precision
12	9M 10 - 9M 11	55.050	55.044	0.006	55.047	9174.500	Within Precision
13	9M 11 - 9M 12	40.048	40.039	0.009	40.044	4449.278	Within Precision
14	9M 12 - 9M 13	45.535	45.542	0.007	45.539	6505.500	Within Precision

15	9M 13 - 9M 14	48.465	48.461	0.004	48.463	12115.750	Within Precision
16	9M 14 - CP 1	40.194	40.200	0.006	40.197	6699.500	Within Precision

Table 2: Horizontal Angle Sheet

KATHMANDU UNIVERSITY

Department of Civil Engineering
Survey Camp, 2022

Observer:Group 9
Date: 16-Aug-22
Recorder:Group 9
Weather: Sunny
Instrument: Theodolite Temperature: 28ºC

Inst. St. & HI	Object	Face	0 set					100 set					Mean of Set			Horizontal Angle			Horizontal angle in Degree	Zenithal Angle			Zenithal angle in Degree	Vertical angle in radian	Stadia Hair Reading			Stadia Interval	Horizontal Distance	
			G	CG	CCG	CG	CCG	G	CG	CCG	CG	CCG	G	CG	CCG	G	CG	CCG		G	CG	CCG			T	M	B		Stadia	Taping
9M3 1.394	9M2	L	0	0	0			100	0	0						102	57	875	92.392	95	88	50	86.337	0.064	0.88	0.64	0.4	0.48	47.804	47.842
		R	200	0	0	0	0	300	0	50	0	25	200	0	12.5															
	9M4	L	102	58	50			202	58	0										108	49	0	97.641	-0.133	0.945	0.715	0.48	0.465	45.678	45.978
		R	302	57	0	57	75	2	58	50	58	25	302	58	0															
9M4 1.422	9M3	L	0	0	0			100	0	0						198	75	125	178.886	90	76	0	81.684	0.145	1.74	1.5	1.27	0.47	46.017	45.961
		R	200	0	50	0	25	300	0	0	0	0	200	0	12.5															
	9M5	L	198	75	0			298	75	0										105	27	50	94.788	-0.084	1.9	1.72	1.54	0.36	35.749	35.887
		R	398	76	0	75	50	98	75	0	75	0	398	75	25															
9M5 1.350	9M4	L	0	0	0			100	0	0						94	25	125	84.836	91	62	50	82.503	0.131	2.045	1.86	1.68	0.365	35.879	35.901
		R	200	0	50	0	25	300	0	0	0	0	200	0	12.5															
	9M6	L	94	25	0			194	25	0										99	5	0	89.145	0.015	0.95	0.67	0.395	0.555	55.488	55.573
		R	294	26	0	25	50	394	25	0	25	0	294	25	25															
9M6 1.110	9M5	L	0	0	0			100	0	0						288	46	75	259.621	100	94	0	90.846	-0.015	0.85	0.57	0.295	0.555	55.488	55.54
		R	200	0	50	0	25	300	0	50	0	25	200	0	25															
	9M7	L	288	47	0			388	47	0										101	55	0	91.395	-0.024	1.95	1.785	1.455	0.495	49.471	49.371
		R	88	47	0	47	0	188	47	0	47	0	88	47	0															
9M7 1.276	9M6	L	0	0	0			100	0	0						176	81	75	159.136	96	0	0	86.4	0.063	1.7	1.457	1.203	0.497	49.504	49.358
		R	200	0	50	0	25	300	0	0	0	0	200	0	12.5															
	CP2	L	176	82	0			276	81	50										99	98	50	90.027	0.000	1.034	0.86	0.69	0.344	34.400	34.524
		R	376	82	50	82	25	76	81	50	81	50	376	81	875															
CP2 1.188	9M7	L	0	0	0			100	0	0						136	39	25	122.753	100	71	50	90.684	-0.012	0.566	0.394	0.221	0.345	34.495	34.526
		R	200	0	0	0	0	300	0	0	0	0	200	0	0															
	9M8	L	136	39	0			236	39	0										100	82	50	90.783	-0.014	1.057	0.83	0.59	0.467	46.691	46.614
		R	336	39	50	39	25	36	39	50	39	25	336	39	25															
9M8 1.568	CP2	L	0	0	0			100	0	0						272	25	875	245.104	100	25	0	90.225	-0.004	1.035	0.8	0.57	0.465	46.499	46.597
		R	200	0	0	0	0	300	0	0	0	0	200	0	0															
	9M9	L	272	26	0			372	25	50										99	26	50	89.379	0.011	0.975	0.755	0.522	0.453	45.295	45.211
		R	72	26	0	26	0	172	26	0	25	75	472	25	875															
9M9 1.258	9M8	L	0	0	0			100	0	0						66	54	875	59.965	99	21	0	89.289	0.012	1.562	1.335	1.11	0.452	45.193	45.206
		R	200	0	50	0	25	300	0	0	0	0	200	0	12.5															
	9M10	L	66	55	0			166	55	0										94	50	50	85.095	0.086	2.125	1.805	1.48	0.645	64.028	64.185
		R	266	55	0	55	0	366	55	0	55	0	266	55	0															
9M10 1.294	9M9	L	0	0	0			100	0	0						140	65	625	126.641	103	80	0	93.42	-0.060	1.08	0.759	0.435	0.645	64.270	64.16

		R	200	0	50	0	25	300	0	0	0	0	200	0	12.5																	
	9M11	L	140	66	0			240	65	50										95	7	0	85.563	0.077	3.63	3.35	3.075	0.555	55.168	55.05
		R	340	66	0	66	0	40	65	50	65	50	340	65	75																	
9M11 1.292	9M10	L	0	0	0			100	0	0										100	88	0	90.792	-0.014	1.84	1.564	1.288	0.552	55.189	55.044
		R	200	0	50	0	25	300	0	0	0	0	200	0	12.5	135	5	375	121.579												
	9M12	L	135	5	50			235	5	50										103	97	0	93.573	-0.062	1.056	0.856	0.654	0.402	40.044	40.028
		R	335	5	50	5	50	35	5	50	5	50	335	5	50																	
9M12 1.190	9M11	L	0	0	0			100	0	0										95	35	0	85.815	0.073	1.27	1.07	0.87	0.4	39.787	40.039
		R	200	0	0	0	0	300	0	0	0	0	200	0	0																	
	9M13	L	346	41	0			46	41	0						346	41	0	311.769	92	21	50	83.034	0.122	1.765	1.535	1.302	0.463	45.619	45.535
		R	146	41	0	41	0	246	41	0	41	0	546	41	0																	
9M13 1.361	9M12	L	0	0	0			100	0	0										105	74	0	95.166	-0.090	1.661	1.431	1.201	0.46	45.627	45.542
		R	200	0	0	0	0	300	0	0	0	0	200	0	0																	
	9M14	L	133	27	0			233	27	0						133	27	0	119.943	93	12	50	83.853	0.107	1.395	1.15	0.905	0.49	48.438	48.465
		R	333	27	0	27	0	33	27	0	27	0	333	27	0																	
9M14 1.284	9M13	L	0	0	0			100	0	0										106	21	0	95.589	-0.098	1.08	0.835	0.59	0.49	48.535	48.461
		R	200	0	0	0	0	300	0	0	0	0	200	0	0																	
	CP1	L	145	23	0			245	22	50						145	22	875	130.777	94	31	50	84.924	0.089	0.875	0.674	0.47	0.405	40.183	40.194
		R	345	23	0	23	0	45	23	0	22	75	345	22	875																	
CP1 1.260	9M14	L	0	0	0			100	0	0										106	39	0	95.751	-0.100	0.813	0.61	0.405	0.408	40.390	40.2
		R	200	0	0	0	0	300	0	0	0	0	200	0	0																	
	9M1	L	101	34	0			201	34	0						101	34	0	91.206	107	26	0	96.534	-0.114	0.55	0.358	0.164	0.386	38.100	38.213
		R	301	34	0	34	0	1	34	0	34	0	301	34	0																	
9M1 1.224	CP1	L	0	0	0			100	0	0										93	88	0	84.492	0.096	0.97	0.776	0.582	0.388	38.443	38.225
		R	200	0	0	0	0	300	0	0	0	0	200	0	0																	
	9M2	L	277	12	0			377	12	0						227	12	25	204.410	98	25	0	88.425	0.027	1.609	1.33	1.05	0.559	55.858	55.727
		R	77	12	50	12	25	177	12	50	12	25	447	12	25																	
9M2 1.528	9M1	L	0	0	0			100	0	0										99	70	0	89.73	0.005	2.391	2.116	1.841	0.55	54.999	55.726
		R	200	0	50	0	25	300	0	0	0	0	200	0	12.5																	
	9M3	L	185	13	50			285	13	50						185	13	50	166.622	102	95	0	92.655	-0.046	0.811	0.571	0.331	0.48	47.897	47.858
		R	385	14	0	13	75	85	13	50	13	50	385	13	62.5																	

Table 3: Traverse Computation Sheet

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey Camp, 2022

Observer: Group 9
Recorder: Group 9
Instrument:

Date: 17-Aug-22
Weather: Cloudy
Temperature: 24°C

Traverse Computation

Stn.	Distance	Horizontal Angle	Angle Corr.	Corrected Angle			Bearing	Consecutive Coordinates		Correction		Corrected Consecutive Coordinate		Independent Coordinates		Corrected Length	Corrected Bearing
				D	M	S		Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.		
CP1	38.219	91° 12' 21.6"	0° 0' 2"	91	12	19.6	246.5	-15.240	-35.049	0.002	0.016	-15.241	-35.033	3055751	331849	38.205	66.488059

9M1	55.727	249° 24' 36.9"	0° 0' 2"	249	24	34.9	315.9097	40.026	-38.774	0.002	0.024	40.023	-38.750	3055735.759	331813.967	55.709	44.074192
9M2	47.85	166° 37' 17.4"	0° 0' 2"	166	37	15.4	302.5306	25.731	-40.343	0.002	0.021	25.729	-40.322	3055775.782	331775.217	47.832	57.458037
9M3	45.97	92° 16' 15.6"	0° 0' 2"	92	16	13.6	214.8011	-37.748	-26.236	0.002	0.020	-37.750	-26.217	3055801.511	331734.895	45.960	34.779525
9M4	35.894	178° 52' 33.6"	0° 0' 2"	178	52	31.6	213.6765	-29.870	-19.903	0.001	0.015	-29.872	-19.888	3055763.762	331708.678	35.887	33.654735
9M5	55.56	84° 45' 33.6"	0° 0' 2"	84	45	31.6 11.7 6.7	118.4353	-26.456	48.857	0.002	0.024	-26.458	48.881	3055733.890	331688.790	55.582	61.574409
9M6	49.365	259° 37' 14.7"	0° 0' 3"	259	37		558.0552	-46.934	-15.300	0.002	0.021	-46.936	-15.279	3055707.432	331737.671	49.360	18.03107
9M7	34.525	159° 8' 8.7"	0° 0' 2"	159	8		537.1904	-34.483	1.692	0.001	0.015	-34.485	1.707	3055660.496	331722.393	34.527	2.8340914
CP2 9M8 9M9 9M10 9M11 9M12 9M13 9M14	46.606	122° 45' 11.1"	0° 0' 2"	122	45	9.7	479.9431	-23.263	40.385	0.002	0.020	-23.265	40.405	3055626.011	331724.100	46.624	60.067199
	45.214	245° 1' 58.8"	0° 0' 2"	245	1	56.8	544.9756	-45.044	-3.921	0.002	0.019	-45.045	-3.902	3055602.746	331764.505	45.214	4.9507975
	64.173	59° 53' 38.4"	0° 0' 2"	59	53	36.4	424.869	27.254	58.098	0.003	0.028	27.251	58.126	3055557.701	331760.603	64.197	64.881544
	55.047	126° 27' 24"	0° 0' 2"	126	27	22	371.3251	53.975	10.810	0.002	0.024	53.973	10.834	3055584.952	331818.729	55.049	11.349733
	40.044	121° 33' 18"	0° 0' 2"	121	33	16	312.8796	27.248	-29.344	0.002	0.017	27.247	-29.326	3055638.925	331829.563	40.030	47.105348
	45.539	311° 46' 84"	0° 0' 3"	311	46	5.2	444.6477	4.248	45.340	0.002	0.020	4.246	45.360	3055666.172	331800.236	45.558	84.652251
	48.463	119° 56' 34.8"	0° 0' 2"	119	56	32.8	384.5901	44.068	20.167	0.002	0.021	44.066	20.187	3055670.418	331845.596	48.470	24.61348
	40.197	130° 42' 18"	0° 0' 2"	130	42	16	335.2946	36.518	-16.800	0.002	0.017	36.516	-16.783	3055714.483	331865.784	40.189	24.684312
Total	748.393	2550° 0' 34"	0° 0' 34"	2550° 0' 0"				0.030	-0.322			0.000	0.000			748.394	

Table 4:Precise Levelling sheet

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey camp, 2022

Observer: Group 9 Date: 18-Aug-22

Recorder: Group 9 Weather: Sunny

Instrument: Auto level Temperature: 29°C

Precise levelling Sheet

Stn	BS			FS			HI	Rise/Fall	RL	Remarks
	T	M	B	T	M	B				
TBM	1.212	1.1840	1.157				1266.279		1265.095	TBM
9M1	1.511	1.4560	1.402	0.585	0.5610	0.536	1267.174	0.623	1265.718	9M1

	1.403	1.3490	1.296	1.700	1.6360	1.572	1266.887	-0.180	1265.538	IS
	1.453	1.4200	1.387	0.546	0.4840	0.423	1267.823	0.865	1266.403	IS
9M2	0.947	0.8730	0.799	1.314	1.2750	1.236	1267.421	0.145	1266.548	9M2
	1.544	1.4950	1.447	2.414	2.3410	2.269	1266.575	-1.468	1265.080	IS
9M3	0.351	0.3000	0.250	1.826	1.7730	1.720	1265.102	-0.278	1264.802	9M3
	0.735	0.6650	0.595	1.920	1.8700	1.820	1263.897	-1.570	1263.232	IS
	0.350	0.2910	0.233	2.654	2.5870	2.521	1261.601	-1.922	1261.310	IS
9M4	0.868	0.8400	0.812	2.940	2.8700	2.800	1259.571	-2.579	1258.731	9M4
	0.498	0.4470	0.396	1.995	1.9590	1.922	1258.059	-1.119	1257.612	IS
	0.398	0.3490	0.300	1.985	1.9600	1.935	1256.448	-1.513	1256.099	IS
9M5	0.906	0.8390	0.772	1.651	1.5930	1.534	1255.694	-1.244	1254.855	9M5
	1.844	1.7770	1.711	0.930	0.8600	0.790	1256.611	-0.021	1254.834	IS
9M6	1.115	1.0350	0.955	0.872	0.7980	0.724	1256.848	0.979	1255.813	9M6
	0.645	0.5850	0.525	2.090	2.0200	1.950	1255.413	-0.985	1254.828	IS
9M7	0.990	0.9150	0.840	2.015	1.9700	1.925	1254.358	-1.385	1253.443	9M7
CP2	0.733	0.6330	0.533	1.040	0.9250	0.810	1254.066	-0.010	1253.433	CP2
9M8	1.789	1.6540	1.519	1.554	1.4200	1.286	1254.300	-0.787	1252.646	9M8
9M9	2.110	1.9800	1.850	1.665	1.5350	1.405	1254.745	0.119	1252.765	9M9
	2.812	2.7700	2.728	0.470	0.3500	0.230	1257.165	1.630	1254.395	IS
	1.769	1.7270	1.685	0.530	0.4800	0.430	1258.412	2.290	1256.685	IS
9M10	1.739	1.6640	1.589	1.466	1.4190	1.372	1258.657	0.308	1256.993	9M10
	1.890	1.8150	1.740	0.647	0.5850	0.523	1259.887	1.079	1258.072	IS
9M 11	0.479	0.4030	0.328	1.205	1.1280	1.050	1259.162	0.687	1258.759	9M11
	0.962	0.9120	0.862	1.968	1.9180	1.868	1258.156	-1.515	1257.244	IS
9M 12	2.018	1.9500	1.883	2.018	1.9770	1.935	1258.129	-1.065	1256.179	9M12
	2.317	2.2430	2.170	0.568	0.5220	0.476	1259.850	1.428	1257.607	IS
	2.766	2.7190	2.672	0.644	0.5500	0.456	1262.019	1.693	1259.300	IS
9M 13	1.181	1.1330	1.085	1.181	1.1330	1.085	1262.019	1.586	1260.886	9M13
	1.872	1.8120	1.752	0.632	0.5890	0.546	1263.242	0.544	1261.430	IS
	1.632	1.5760	1.520	0.371	0.3240	0.276	1264.494	1.488	1262.918	IS
	2.270	2.1770	2.085	0.285	0.2300	0.175	1266.441	1.346	1264.264	IS
9M 14	2.009	1.9070	1.806	0.714	0.6430	0.572	1267.705	1.534	1265.798	9M14
	2.702	2.6430	2.584	0.453	0.3590	0.264	1269.989	1.548	1267.346	IS
CP1	0.495	0.4220	0.350	0.482	0.4300	0.378	1269.981	2.213	1269.559	CP1
	0.460	0.3950	0.330	2.722	2.6770	2.632	1267.699	-2.255	1267.304	IS
	1.173	1.1220	1.071	1.830	1.7380	1.646	1267.083	-1.343	1265.961	IS
TBM				2.010	1.9600	1.910	1265.123	-0.838	1265.123	TBM

Table 5: Adjustment of level

KATHMANDU UNIVERSITY

Department of Civil Engineering
Survey camp, 2022

Observer: Group 9
Recorder: Group 9
Instrument: Auto level

Date: 18-Aug-22
Weather: Sunny
Temperature: 29ºC

Adjustment of level

S.N	Station	Distance		Total Distance	Cumulative Distance	Observed Elevations	Correction	Adjusted Elevations	Remarks
		BS	FS						
1	TBM	5.500	0.000	5.500	5.500	1265.095	0.000	1265.095	TBM

2	9M1	10.900	4.900	15.800	21.300	1265.718	0.001	1265.717	9M1
3		10.700	12.800	23.500	44.800	1265.538	0.001	1265.537	IS
4		6.600	12.300	18.900	63.700	1266.403	0.002	1266.401	IS
5	9M2	14.800	7.800	22.600	86.300	1266.548	0.002	1266.546	9M2
6		9.740	14.500	24.240	110.540	1265.080	0.003	1265.077	IS
7	9M3	10.100	10.600	20.700	131.240	1264.802	0.004	1264.798	9M3
8		14.000	10.000	24.000	155.240	1263.232	0.004	1263.228	IS
9		11.700	13.300	25.000	180.240	1261.310	0.005	1261.305	IS
10	9M4	5.600	14.000	19.600	199.840	1258.731	0.006	1258.725	9M4
11		10.200	7.300	17.500	217.340	1257.612	0.006	1257.606	IS
12		9.800	5.000	14.800	232.140	1256.099	0.007	1256.092	IS
13	9M5	13.400	11.700	25.100	257.240	1254.855	0.007	1254.848	9M5
14		13.300	14.000	27.300	284.540	1254.834	0.008	1254.826	IS
15	9M6	16.000	14.800	30.800	315.340	1255.813	0.009	1255.804	9M6
16		12.000	14.000	26.000	341.340	1254.828	0.010	1254.818	IS
17	9M7	15.000	9.000	24.000	365.340	1253.443	0.010	1253.433	9M7
18	CP2	20.000	23.000	43.000	408.340	1253.433	0.012	1253.421	CP2
19	9M8	27.000	26.800	53.800	462.140	1252.646	0.013	1252.633	9M8
20	9M9	26.000	26.000	52.000	514.140	1252.765	0.015	1252.750	9M9
21		8.400	24.000	32.400	546.540	1254.395	0.016	1254.379	IS
22		8.400	10.000	18.400	564.940	1256.685	0.016	1256.669	IS
23	9M10	15.000	9.400	24.400	589.340	1256.993	0.017	1256.976	9M10
24		15.000	12.400	27.400	616.740	1258.072	0.018	1258.054	IS
25	9M 11	15.100	15.500	30.600	647.340	1258.759	0.018	1258.741	9M11
26		10.000	10.000	20.000	667.340	1257.244	0.019	1257.225	IS
27	9M 12	13.500	8.300	21.800	689.140	1256.179	0.020	1256.159	9M12
28		14.700	9.200	23.900	713.040	1257.607	0.020	1257.587	IS
29		9.400	18.800	28.200	741.240	1259.300	0.021	1259.279	IS
30	9M 13	9.600	9.600	19.200	760.440	1260.886	0.022	1260.864	9M13
31		12.000	8.600	20.600	781.040	1261.430	0.022	1261.408	IS
32		11.200	9.500	20.700	801.740	1262.918	0.023	1262.895	IS
33		18.500	11.000	29.500	831.240	1264.264	0.024	1264.240	IS
34	9M 14	20.300	14.200	34.500	865.740	1265.798	0.025	1265.773	9M14
35		11.800	18.900	30.700	896.440	1267.346	0.026	1267.320	IS
36	CP1	14.500	10.400	24.900	921.340	1269.559	0.026	1269.533	CP1
37		13.000	9.000	22.000	943.340	1267.304	0.027	1267.277	IS
38		10.200	18.400	28.600	971.940	1265.961	0.028	1265.933	IS
39	TBM	0.000	10.000	10.000	981.940	1265.123	0.028	1265.095	TBM

Table 6: Ordinary Levelling Sheet

KATHMANDU UNIVERSITY

Department of Civil Engineering
Survey camp, 2022

Observer:	Group 9	Date:	19-Aug-22
Recorder:	Group 9	Weather:	Sunny
Instrument:	Total station	Temperature:	28°C

Ordinary Levelling Sheet

Station	BS	FS	Rise/fall	RL	Remarks

PBM	1.214			1263	PBM
	1.635	0.387	0.827	1263.827	
	1.89	0.208	1.427	1265.254	
	1.624	0.19	1.7	1266.954	
	1.783	0.163	1.461	1268.415	
	1.969	0.388	1.395	1269.81	
	1.892	0.339	1.63	1271.44	
	2.039	0.371	1.521	1272.961	
	2.008	0.079	1.96	1274.921	
	1.897	0.185	1.823	1276.744	
	1.832	0.045	1.852	1278.596	
	1.797	0.283	1.549	1280.145	
	1.886	0.139	1.658	1281.803	
	1.734	0.333	1.553	1283.356	
	0.977	0.901	0.833	1284.189	
TBM 2	0.938	0.938	0.039	1284.228	TBM 2
	1.258	1.081	-0.143	1284.085	
	0.424	1.776	-0.518	1283.567	
	0.42	1.872	-1.448	1282.119	
	0.318	1.75	-1.33	1280.789	
	0.266	1.891	-1.573	1279.216	
	0.146	1.89	-1.624	1277.592	
	0.397	1.972	-1.826	1275.766	
	0.393	2.476	-2.079	1273.687	
	0.039	2.108	-1.715	1271.972	
	0.355	2.344	-2.305	1269.667	
	0.414	2.188	-1.833	1267.834	
	0.363	2.164	-1.75	1266.084	
	0.694	2.045	-1.682	1264.402	
	0.987	1.755	-1.061	1263.341	
PBM		1.296	-0.309	1263.032	PBM
	Arthmetic check	0.032	0.032	0.032	
TBM 2	1.18			1284.228	
	0.164	1.007	0.173	1284.401	
	0.512	2.188	-2.024	1282.377	
	0.37	1.987	-1.475	1280.902	
	0.917	1.917	-1.547	1279.355	
	0.338	2.163	-1.246	1278.109	
	0.448	2.028	-1.69	1276.419	
	0.302	1.785	-1.337	1275.082	
	0.478	2.247	-1.945	1273.137	
	0.506	2.115	-1.637	1271.5	
	0.334	1.985	-1.479	1270.021	

	0.167	1.909	-1.575	1268.446	
	1.033	2.381	-2.214	1266.232	
TBM	1.962	2.155	-1.122	1265.11	TBM
	2.163	0.581	1.381	1266.491	
	2.067	0.241	1.922	1268.413	
	1.925	0.174	1.893	1270.306	
	1.964	0.278	1.647	1271.953	
	1.722	0.444	1.52	1273.473	
	1.708	0.625	1.097	1274.57	
	1.844	0.362	1.346	1275.916	
	1.993	0.594	1.25	1277.166	
	1.734	0.556	1.437	1278.603	
	1.592	0.495	1.239	1279.842	
	1.8	0.346	1.246	1281.088	
	1.624	0.258	1.542	1282.63	
	1.381	0.194	1.43	1284.06	
		1.181	0.2	1284.26	TBM 2
	Arithmetic check	0.032	0.032	0.032	

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey Camp, 2022

Observer: Group 9
Recorder: Group 9
Instrument: Theodolite

Date: 22-Aug-22
Weather: Cloudy
Temperature: 24°C

Tachometric Sheet

Instrument Station: CP1 RL of Instrument Station: 1269.533 Height of Instrument: 1.384

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance m.	Reduced Level m.	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B			
9M14	47	14	0	42.426	42	25	33.6	111	60	0	100.440	100	26	24	0.810	0.655	0.500	29.982	1264.738	BC
	67	16	0	60.444	60	26	38.4	112	68	0	101.412	101	24	43.2	0.545	0.400	0.250	28.345	1264.795	BC
	67	18	0	60.462	60	27	43.2	109	61	50	98.654	98	39	12.6	1.165	1.000	0.830	32.742	1264.934	BC
	67	2	50	60.323	60	19	21	109	61	50	98.654	98	39	12.6	0.695	0.510	0.325	36.162	1264.903	BC
	79	97	0	71.973	71	58	22.8	109	56	0	98.604	98	36	14.4	0.490	0.295	0.100	38.127	1264.853	RC
	79	97	0	71.973	71	58	22.8	109	23	0	98.307	98	18	25.2	0.655	0.470	0.280	36.717	1265.086	RC
	83	10	0	74.790	74	47	24	109	23	0	98.307	98	18	25.2	0.750	0.520	0.330	41.123	1264.393	RC
	139	80	50	125.825	125	49	28.2	109	11	50	98.204	98	12	12.6	1.180	1.140	1.100	7.837	1268.647	BC
	174	15	0	156.735	156	44	6	109	11	0	98.199	98	11	56.4	1.205	1.160	1.115	8.817	1268.487	BC
	151	97	50	136.778	136	46	39	96	60	0	86.940	86	56	24	3.440	3.365	3.290	14.957	1268.352	BC
	204	12	50	183.713	183	42	45	96	51	0	86.859	86	51	32.4	1.280	1.200	1.120	15.952	1270.592	Fence
	252	90	0	227.610	227	36	36	91	4	0	81.936	81	56	9.6	1.385	1.300	1.220	16.175	1271.909	Fence
	324	41	0	291.969	291	58	8.4	92	37	0	83.133	83	7	58.8	2.680	2.535	2.390	28.585	1271.825	Fence
	333	22	0	299.898	299	53	52.8	92	89	0	83.601	83	36	3.6	1.000	0.920	0.840	15.801	1271.769	GP
	373	7	0	335.763	335	45	46.8	11	76	0	10.584	10	35	2.4	0.965	0.920	0.875	0.304	1271.622	GP
	367	71	0	330.939	330	56	20.4	102	41	0	92.169	92	10	8.4	0.920	0.880	0.840	7.989	1269.734	GP
	367	71	0	330.939	330	56	20.4	102	41	0	92.169	92	10	8.4	0.680	0.595	0.510	16.976	1269.679	GP
	364	47	0	328.023	328	1	22.8	98	12	0	88.308	88	18	28.8	1.790	0.880	0.840	94.917	1272.841	GP
	49	71	50	44.744	44	44	36.6	115	6	50	103.559	103	33	30.6	0.945	0.860	0.780	15.593	1266.297	GP
	50	58	0	45.522	45	31	19.2	115	3	0	103.527	103	31	37.2	1.170	1.075	0.980	17.960	1265.521	GP
	47	2	50	42.323	42	19	21	114	33	50	102.902	102	54	5.4	0.845	0.750	0.600	23.279	1264.835	GP
	100	96	0	90.864	90	51	50.4	124	89	0	112.401	112	24	3.6	0.745	0.710	0.680	5.556	1267.917	GP
	100	30	50	90.275	90	16	28.2	109	40	0	98.460	98	27	36	1.570	1.500	1.440	12.719	1267.525	GP
	129	31	0	116.379	116	22	44.4	109	36	50	98.429	98	25	42.6	0.523	0.440	0.360	15.950	1268.114	GP
	141	85	0	127.665	127	39	54	107	85	0	97.065	97	3	54	0.960	0.860	0.760	19.697	1267.616	GP

Table 7: Tacheometric Sheet CP1

Instrument Station: 9M1 RL of Instrument Station: 1265.717 Height of Instrument: 1.446

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance	Reduced Level	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B	m.	m.	
CP1	398	19	0	358.371	358	22	15.6	99	51	50	89.564	89	33	48.6	1.16	1.07	0.99	16.999	1266.223	building cor
	339	97	50	305.978	305	58	39	99	54	0	89.586	89	35	9.6	1.175	1.1	1.02	15.499	1266.175	building cor
	347	72	50	312.953	312	57	9	98	60	0	88.740	88	44	24	1.52	1.42	1.32	19.990	1266.183	building cor
	318	8	50	286.277	286	16	35.4	98	45	0	88.605	88	36	18	0.34	0.22	0.1	23.986	1267.527	gate
	328	86	0	295.974	295	58	26.4	98	33	0	88.497	88	29	49.2	0.365	0.26	0.15	21.485	1267.467	gate
	313	94	0	282.546	282	32	45.6	98	34	0	88.506	88	30	21.6	0.4	0.29	0.18	21.985	1267.446	guard
	305	73	50	275.162	275	9	41.4	96	86	0	87.174	87	10	26.4	0.97	0.845	0.72	24.939	1267.549	guard
	274	21	0	246.789	246	47	20.4	97	78	50	88.007	88	0	23.4	1.685	1.63	1.57	11.486	1265.933	fc
	260	73	0	234.657	234	39	25.2	100	78	0	90.702	90	42	7.2	1.27	1.235	1.195	7.499	1265.836	pole
	183	45	0	165.105	165	6	18	110	30	50	99.275	99	16	28.2	2.66	2.55	2.44	21.429	1261.114	bc
	179	20	0	161.280	161	16	48	105	71	0	95.139	95	8	20.4	3.56	3.41	3.26	29.759	1261.077	bc
	166	98	50	150.287	150	17	11.4	105	72	0	95.148	95	8	52.8	3.65	3.5	3.35	29.758	1260.982	bc
	136	54	0	122.886	122	53	9.6	110	95	0	99.855	99	51	18	0.475	0.305	0.315	15.531	1264.160	bc
	128	9	50	115.286	115	17	7.8	108	33	50	97.502	97	30	5.4	2.82	2.69	2.56	25.557	1261.108	bc
	117	28	0	105.552	105	33	7.2	108	33	50	97.502	97	30	5.4	2.37	2.22	2.07	29.489	1261.060	bc
	196	44	0	176.796	176	47	45.6	108	30	0	97.470	97	28	12	1.53	1.505	1.48	4.915	1265.013	gp
	218	58	50	196.727	196	43	35.4	108	21	0	97.389	97	23	20.4	1.655	1.6	1.55	10.326	1264.224	gp
	212	7	0	190.863	190	51	46.8	106	80	0	96.120	96	7	12	1.98	1.89	1.8	17.795	1263.365	gp
	203	20	0	182.880	182	52	48	109	54	50	98.591	98	35	25.8	1.91	1.81	1.71	19.554	1262.399	gp
	191	71	50	172.544	172	32	36.6	109	56	0	98.604	98	36	14.4	1.69	1.535	1.38	30.306	1261.042	gp
	156	67	0	141.003	141	0	10.8	110	86	0	99.774	99	46	26.4	2.18	2.1	1.02	112.657	1245.656	gp
	150	9	0	135.081	135	4	51.6	110	78	50	99.707	99	42	23.4	1.47	1.32	1.17	29.147	1260.857	gp
	154	66	50	139.199	139	11	54.6	110	87	0	99.783	99	46	58.8	2.04	1.97	1.9	13.596	1262.849	gp
	146	53	0	131.877	131	52	107	110	86	0	99.774	99	46	26.4	1.55	1.5	1.45	9.712	1263.990	gp
	112	29	0	101.061	101	3	39.6	107	37	0	96.633	96	37	58.8	2.16	1.99	1.81	34.533	1261.157	gp
	112	76	0	101.484	101	29	2.4	105	70	0	95.130	95	7	48	1.745	1.65	1.56	18.352	1263.865	gp
	112	18	0	100.962	100	57	43.2	105	71	0	95.139	95	8	20.4	1.69	1.65	1.61	7.936	1264.799	gp
	234	96	0	211.464	211	27	50.4	104	94	0	94.446	94	26	45.6	1.5	1.310	1.12	37.772	1262.916	gp
	222	45	50	200.210	200	12	34.2	100	50	0	90.450	90	27	1.0232E-11	1.44	1.29	1.14	29.998	1265.637	gp
	216	96	0	195.264	195	15	50.4	107	47	0	96.723	96	43	22.8	1.49	1.325	1.15	33.534	1261.885	gp
	211	89	0	190.701	190	42	3.6	107	28	0	96.552	96	33	7.2	1.74	1.54	1.34	39.479	1261.089	gp

Table 8: Tacheometric Sheet 9M1

Instrument Station: 9M2 RL of Instrument Station: 1266.546 Height of Instrument: 1.384

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance	Reduced Level	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B	m.	m.	
9M1	153	5	0	137.745	137	44	42	110	13	0	99.117	99	7	1.2	1.543	1.462	1.38	15.891	1263.918	cauliflower garden
	146	62	0	131.958	131	57	28.8	110	13	0	99.117	99	7	1.2	1.15	1.06	0.97	17.548	1264.054	cauliflower garden
	141	4	0	126.936	126	56	9.6	110	14	0	99.126	99	7	33.6	0.848	0.745	0.645	19.789	1264.006	cauliflower garden
	139	50	0	125.550	125	32	60	110	14	0	99.126	99	7	33.6	1.27	1.163	1.055	20.959	1263.400	cauliflower garden
	135	13	50	121.622	121	37	17.4	110	14	50	99.131	99	7	49.8	0.903	0.844	0.785	11.503	1265.237	cauliflower garden
	131	27	50	118.148	118	8	51	105	50	50	94.955	94	57	16.2	2.34	2.175	2.01	32.754	1262.916	cauliflower garden
	123	63	0	111.267	111	16	1.2	102	63	0	92.367	92	22	1.2	3.806	3.69	3.575	23.061	1263.287	cauliflower garden
	127	84	0	115.056	115	3	21.6	103	32	50	92.993	92	59	33	3.328	3.224	3.12	20.743	1263.622	cauliflower garden
	132	81	0	119.529	119	31	44.4	107	28	50	96.557	96	33	23.4	2.44	2.344	2.25	18.752	1263.431	cauliflower garden
	124	89	0	112.401	112	24	3.6	105	95	50	95.360	95	21	34.2	2.825	2.74	2.655	16.852	1263.609	cauliflower garden
	129	85	50	116.870	116	52	10.2	105	87	0	95.283	95	16	58.8	2.838	2.764	2.69	14.675	1263.809	cauliflower garden
	136	24	0	122.616	122	36	57.6	109	11	0	98.199	98	11	56.4	2.167	2.104	2.04	12.442	1264.033	cauliflower garden
	38	65	0	34.785	34	47	6	111	4	0	99.936	99	56	9.6	1.732	1.651	1.57	15.718	1263.526	cauliflower garden
	46	73	50	42.062	42	3	41.4	104	21	0	93.789	93	47	20.4	3.204	3.117	3.031	17.224	1263.672	cauliflower garden
	51	90	0	46.710	46	42	36	105	6	50	94.559	94	33	30.6	2.88	2.782	2.685	19.377	1263.603	cauliflower garden
	53	70	0	48.330	48	19	48	105	7	0	94.563	94	33	46.8	2.764	2.665	2.565	19.774	1263.687	cauliflower garden
	58	25	0	52.425	52	25	30	103	35	0	93.015	93	0	54	3.268	3.16	3.05	21.740	1263.625	cauliflower garden
	61	36	50	55.229	55	13	42.6	103	25	50	92.930	92	55	46.2	3.289	3.17	3.05	23.838	1263.540	cauliflower garden
	43	31	0	38.979	38	58	44.4	106	48	0	95.832	95	49	55.2	1.419	1.285	1.15	26.622	1263.926	Building 23 24
	23	33	50	21.002	21	0	5.4	106	75	0	96.075	96	4	30	1.735	1.62	1.505	22.742	1263.890	Building 23 25
	18	94	50	17.051	17	3	1.8	106	99	0	96.291	96	17	27.6	1.051	0.909	0.765	28.257	1263.906	Building 23 26
	18	73	50	16.862	16	51	41.4	104	26	50	93.839	93	50	18.6	1.041	0.82	0.6	43.902	1264.164	22 road side
	11	90	0	10.710	10	42	36	103	24	0	92.916	92	54	57.6	1.239	1.03	0.82	41.792	1264.771	road cor
	13	68	0	12.312	12	18	43.2	103	24	0	92.916	92	54	57.6	1.23	0.999	0.77	45.881	1264.594	road right
	378	65	50	340.790	340	47	22.2	99	61	50	89.654	89	39	12.6	0.669	0.565	0.46	20.899	1267.491	tree
	371	95	50	334.760	334	45	34.2	97	23	50	87.512	87	30	41.4	1.385	1.295	1.205	17.966	1267.416	fence
	299	15	0	269.235	269	14	6	99	60	0	89.640	89	38	24	0.679	0.65	0.622	5.700	1267.316	tree
	243	4	0	218.736	218	44	9.6	99	58	0	89.622	89	37	19.2	1.335	1.310	1.285	5.000	1266.653	pole
	276	86	0	249.174	249	10	26.4	99	15	50	89.240	89	14	22.2	0.635	0.598	0.56	7.499	1267.432	fence
	232	86	0	209.574	209	34	26.4	98	84	0	88.956	88	57	21.6	0.861	0.781	0.7	16.095	1267.442	fence
	168	38	0	151.542	151	32	31.2	106	71	0	96.039	96	2	20.4	1.158	1.124	1.09	6.725	1266.095	GP
	169	5	0	152.145	152	8	42	106	77	0	96.093	96	5	34.8	1.019	0.959	0.9	11.766	1265.715	GP
	167	67	0	150.903	150	54	10.8	106	74	0	96.066	96	3	57.6	1.111	1.033	0.955	15.426	1265.258	GP
	32	20	0	28.980	28	58	48	109	68	0	98.712	98	42	43.2	1.333	1.299	1.205	12.506	1264.715	GP
	169	41	0	152.469	152	28	8.4	106	77	0	96.093	96	5	34.8	1.074	0.979	0.88	19.181	1264.903	GP
	32	12	0	28.908	28	54	28.8	110	33	50	99.302	99	18	5.4	0.938	0.869	0.8	13.439	1264.860	GP
	35	11	50	31.604	31	36	12.6	107	98	0	97.182	97	10	55.2	1.609	1.505	1.4	20.573	1263.833	GP
	35	56	0	32.004	32	0	14.4	107	98	0	97.182	97	10	55.2	0.495	0.422	0.35	14.273	1265.709	GP
	35	95	50	32.360	32	21	34.2	104	22	50	93.803	93	48	9	1.391	1.27	1.15	23.994	1265.065	GP
	16	85	0	15.165	15	9	54	104	22	0	93.798	93	47	52.8	1.645	1.459	1.27	37.335	1263.992	GP

Table 9: Tacheometric Sheet 9M2

Instrument Station: 9M3 RL of Instrument Station: 1264.798 Height of Instrument: 1.434

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance	Reduced Level	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B	m.	m.	
9M2	39	69	50	35.726	35	43	31.8	109	64	0	98.676	98	40	33.6	0.912	0.87	0.818	9.186	1263.855	c.c
	22	13	0	19.917	19	55	1.2	109	64	0	98.676	98	40	33.6	1.02	0.975	0.929	8.893	1263.990	c.c
	4	54	50	4.091	4	5	25.8	109	63	50	98.672	98	40	17.4	0.93	0.885	0.84	8.795	1263.599	c.c
	57	25	0	51.525	51	31	30	105	8	0	94.572	94	34	19.2	1.392	1.292	1.192	19.873	1263.269	c.c
	50	49	0	45.441	45	26	27.6	105	8	0	94.572	94	34	19.2	1.473	1.374	1.282	18.979	1263.357	c.c
	43	84	50	39.461	39	27	37.8	105	8	0	94.572	94	34	19.2	1.443	1.357	1.271	17.091	1263.230	c.c
	163	90	0	147.510	147	30	36	105	8	0	94.572	94	34	19.2	1.83	1.635	1.442	38.553	1261.547	fence
	176	28	50	158.657	158	39	23.4	102	2	0	91.818	91	49	4.8	1.76	1.602	1.444	31.568	1263.571	fence
	182	89	0	164.601	164	36	3.6	102	1	0	91.809	91	48	32.4	1.83	1.659	1.492	33.766	1263.770	fence
	193	63	50	174.272	174	16	17.4	99	69	50	89.726	89	43	31.8	1.579	1.396	1.215	36.399	1264.956	fence
	211	55	0	190.395	190	23	42	98	1	50	88.214	88	12	48.6	1.605	1.45	1.25	35.465	1266.678	fence
	252	25	0	227.025	227	1	30	96	54	0	86.886	86	53	9.6	0.785	0.66	0.535	24.926	1266.736	fence
	327	1	0	294.309	294	18	32.4	94	53	0	85.077	85	4	37.2	0.97	0.852	0.735	23.327	1267.039	fence
	356	23	0	320.607	320	36	25.2	94	53	0	85.077	85	4	37.2	1.344	1.202	1.06	28.191	1267.703	fence
	357	0	0	321.300	321	18	4.0927E-11	96	67	0	87.003	87	0	10.8	1.07	0.957	0.842	22.738	1266.234	g.p
	357	44	50	321.701	321	42	1.8	96	67	0	87.003	87	0	10.8	1.268	1.188	1.108	15.956	1266.265	g.p
	372	1	0	334.809	334	48	32.4	100	89	0	90.801	90	48	3.6	0.864	0.802	0.753	11.098	1264.753	g.p
	366	84	50	330.161	330	9	37.8	100	89	0	90.801	90	48	3.6	1.352	1.324	1.296	5.599	1264.998	g.p
	318	72	0	286.848	286	50	52.8	100	89	0	90.801	90	48	3.6	1.178	1.156	1.134	4.399	1265.368	g.p
	318	5	0	286.245	286	14	42	97	47	0	87.723	87	43	22.8	0.847	0.802	0.757	8.986	1265.384	g.p
	318	15	0	286.335	286	20	6	94	47	0	85.023	85	1	22.8	1.286	1.205	1.124	16.078	1266.185	g.p
	234	39	0	210.951	210	57	3.6	97	31	50	87.584	87	35	0.6	1.475	1.447	1.42	5.490	1265.597	g.p
	237	79	0	214.011	214	0	39.6	97	31	0	87.579	87	34	44.4	0.917	0.867	0.817	9.982	1265.928	g.p
	241	61	0	217.449	217	26	56.4	97	31	50	87.584	87	35	0.6	0.831	0.726	0.622	20.863	1266.216	g.p
	224	80	0	202.320	202	19	12	97	31	50	87.584	87	35	0.6	0.978	0.896	0.806	17.169	1266.323	g.p
	203	56	0	183.204	183	12	14.4	102	69	50	92.426	92	25	31.8	0.718	0.634	0.549	16.870	1265.105	g.p
	170	25	0	153.225	153	13	30	102	70	0	92.430	92	25	48	0.52	0.412	0.316	20.363	1263.649	g.p
	168	19	50	151.376	151	22	31.8	102	69	50	92.426	92	25	31.8	1.838	1.719	1.6	23.757	1263.468	g.p
	182	84	0	164.556	164	33	21.6	102	69	50	92.426	92	25	31.8	1.808	1.758	1.708	9.982	1264.911	g.p
	183	35	0	165.015	165	0	54	102	69	50	92.426	92	25	31.8	0.972	0.898	0.825	14.674	1264.392	g.p
	180	3	0	162.027	162	1	37.2	102	69	50	92.426	92	25	31.8	1.325	1.218	1.112	21.262	1265.331	g.p

Table 10: 9M3

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey Camp, 2022

Observer: Group 9
Recorder: Group 9
Instrument: Theodolite

Date: 21-Aug-22
Weather: Sunny
Temperatur 29°C

Tachometric Sheet

Instrument Station: 9M4 RL of Instrument Station: 1258.725 Height of Instrument: 1.516

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance	Reduced Level	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B	m.	m.	
9M3	197	63	0	177.867	177	52	1	106	51	50	95.864	95	51	49	1.796	1.710	1.625	16.922	1256.793	Hut corner
	178	71	0	160.839	160	50	20	106	58	0	95.922	95	55	19	1.850	1.765	1.680	16.819	1256.731	Hut corner
	164	53	0	148.077	148	4	37	110	94	50	99.851	99	51	2	1.640	1.565	1.490	14.561	1256.148	Hut corner
	153	30	0	137.970	137	58	12	106	7	0	95.463	95	27	47	2.572	2.491	2.410	16.053	1256.215	Hut corner
	178	4	0	160.236	160	14	10	106	7	50	95.468	95	28	3	2.160	2.060	1.460	69.365	1251.542	Hut corner
	39	69	50	35.726	35	43	32	93	98	50	84.587	84	35	11	0.890	0.850	0.810	7.929	1260.142	Vegetation
	16	74	50	15.071	15	4	14	94	0	50	84.605	84	36	16	1.316	1.258	1.200	11.497	1260.069	Vegetation
	70	8	50	63.077	63	4	35	95	37	50	85.838	85	50	15	1.873	1.741	1.610	26.161	1260.404	Vegetation
	85	97	50	77.378	77	22	39	97	17	0	87.453	87	27	11	1.546	1.272	0.995	54.991	1261.415	House 26
	79	90	0	71.910	71	54	36	97	26	0	87.534	87	32	2	1.465	1.200	0.915	54.898	1261.405	House 26
	89	48	50	80.537	80	32	11	97	26	50	87.539	87	32	19	1.735	1.422	1.109	62.485	1261.505	House 26
	98	54	0	88.686	88	41	10	101	80	0	91.620	91	37	12	1.090	0.914	0.740	34.972	1258.338	House 28
	108	93	0	98.037	98	2	13	96	73	50	87.062	87	3	41	3.830	3.660	3.490	33.911	1258.322	House 28
	110	21	0	99.189	99	11	20	97	3	50	87.332	87	19	53	4.024	3.810	3.600	42.308	1258.403	House 28
	101	17	50	91.058	91	3	27	96	43	0	86.787	86	47	13	4.451	4.240	4.020	42.965	1258.413	House 28
	357	12	50	321.413	321	24	45	96	44	50	86.801	86	48	2	1.820	1.775	1.730	8.972	1258.968	GP
	357	22	0	321.498	321	29	53	96	45	0	86.805	86	48	18	2.139	2.051	1.965	17.346	1259.158	GP
	357	2	0	321.318	321	19	5	96	45	0	86.805	86	48	18	1.128	0.992	0.860	26.717	1260.740	GP
	356	34	0	320.706	320	42	22	96	45	0	86.805	86	48	18	0.615	0.450	0.285	32.897	1261.627	GP
	356	42	50	320.783	320	46	57	95	12	0	85.608	85	36	29	1.042	0.850	0.650	38.970	1262.384	GP
	356	87	0	321.183	321	10	59	93	58	0	84.222	84	13	19	0.806	0.599	0.390	41.178	1263.809	GP
	386	91	0	348.219	348	13	8	91	37	0	82.233	82	13	59	0.840	0.670	0.498	33.575	1264.151	GP
	386	91	0	348.219	348	13	8	91	33	50	82.202	82	12	5	1.289	1.120	0.950	33.276	1263.678	GP
	385	25	0	346.725	346	43	30	92	55	0	83.295	83	17	42	0.984	0.784	0.640	33.931	1263.446	GP
	385	77	0	347.193	347	11	35	92	50	0	83.250	83	15	0	1.430	1.291	1.151	27.515	1262.207	GP
	385	65	0	347.085	347	5	6	92	61	50	83.354	83	21	13	1.070	0.945	0.821	24.566	1262.159	GP
	385	61	50	347.054	347	3	13	93	40	0	84.060	84	3	36	1.490	1.370	1.250	23.743	1261.341	GP
	385	30	0	346.770	346	46	12	93	35	0	84.015	84	0	54	1.035	0.942	0.850	18.299	1261.217	GP
	385	30	50	346.775	346	46	28	93	35	0	84.015	84	0	54	1.789	1.698	1.610	17.705	1260.399	GP
	384	30	0	345.870	345	52	12	93	33	0	83.997	83	59	49	1.327	1.269	1.200	12.561	1260.293	GP
	384	22	0	345.798	345	47	53	93	33	0	83.997	83	59	49	1.910	1.847	1.785	12.363	1259.694	GP
	384	89	50	346.406	346	24	20	93	88	50	84.497	84	29	47	1.312	1.281	1.250	6.143	1259.552	GP
	384	74	0	346.266	346	15	58	97	17	0	87.453	87	27	11	1.786	1.759	1.730	5.589	1258.731	GP
	8	90	0	8.010	8	0	36	97	15	0	87.435	87	26	6	1.658	1.631	1.603	5.489	1258.856	GP
	8	14	0	7.326	7	19	34	97	15	0	87.435	87	26	6	1.056	1.015	0.980	7.585	1259.566	GP
	9	10	0	8.190	8	11	24	90	79	50	81.716	81	42	56	1.888	1.765	1.702	18.214	1261.128	GP
	11	50	0	10.350	10	21	0	94	88	50	85.397	85	23	47	1.269	1.184	1.100	16.791	1260.409	GP

Table 11:Tacheometric Sheet 9M4

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey Camp, 2022

Observer: Group 9
Recorder: Group 9
Instrument: Theodolite

Date: 21-Aug-22
Weather: Sunny
Temperatu 29°C

Tachometric Sheet

Instrument Station: 9M5 RL of Instrument Station: 1254.848 Height of Instrument: 1.534

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance	Reduced Level	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B	m.	m.	
9M4	69	68	50	62.717	62	42	59.4	93	62	50	84.263	84	15	45	1.98	1.96	1.94	3.960	1254.820	hut corner
	86	15	0	77.535	77	32	6	97	57	50	87.818	87	49	3	1.88	1.83	1.778	10.185	1254.940	hut corner
	28	97	50	26.078	26	4	39	97	57	50	87.818	87	49	3	1.714	1.675	1.637	7.689	1255.000	hut corner
	64	68	50	58.217	58	12	59.4	98	10	0	88.290	88	17	24	1.962	1.85	1.74	22.180	1255.194	buliding cor
	98	67	50	88.808	88	48	27	103	90	0	93.510	93	30	36	1.024	0.93	0.832	19.128	1254.279	agri
	110	70	0	99.630	99	37	48	100	60	0	90.540	90	32	24	2.759	2.704	2.65	10.899	1253.575	building
	178	83	50	160.952	160	57	5.4	100	61	0	90.549	90	32	56.4	2.657	2.64	2.622	3.500	1253.708	building
	248	49	50	223.646	223	38	43.8	108	56	0	97.704	97	42	14.4	1.93	1.815	1.7	22.587	1251.512	gate
	250	29	50	225.266	225	15	55.8	108	54	0	97.686	97	41	9.6	1.804	1.721	1.64	16.107	1252.487	GP
	257	72	0	231.948	231	56	52.8	108	53	50	97.682	97	40	53.4	1.859	1.799	1.74	11.687	1253.007	GP
	263	14	0	236.826	236	49	33.6	112	60	0	101.340	101	20	24	1.295	1.253	1.213	7.883	1253.548	GP
	268	0	0	241.200	241	11	60	112	58	0	101.322	101	19	19.2	0.719	0.684	0.65	6.634	1254.370	GP
	273	83	50	246.452	246	27	5.4	115	18	50	103.667	103	39	59.4	1.041	1.018	0.995	4.343	1254.308	GP
	272	38	0	245.142	245	8	31.2	104	10	0	93.690	93	41	24	1.247	1.23	1.213	3.386	1254.934	GP
	308	7	50	277.268	277	16	3	104	10	0	93.690	93	41	24	1.168	1.15	1.133	3.486	1255.007	GP
	317	65	0	285.885	285	53	6	104	10	0	93.690	93	41	24	1.384	1.34	1.297	8.664	1254.483	GP
	349	89	50	314.906	314	54	19.8	103	0	50	92.705	92	42	16.2	0.86	0.805	0.75	10.976	1255.059	GP
	369	29	50	332.366	332	21	55.8	101	18	0	91.062	91	3	43.2	0.619	0.55	0.846	-22.692	1256.253	GP
	379	49	50	341.546	341	32	43.8	101	18	0	91.062	91	3	43.2	1.222	1.175	1.13	9.197	1255.037	GP
	381	11	50	343.004	343	0	12.6	101	17	50	91.058	91	3	27	0.367	0.3	0.232	13.495	1255.833	GP
	392	37	50	353.138	353	8	15	100	72	0	90.648	90	38	52.8	0.452	0.376	0.3	15.198	1255.834	GP
	392	65	0	353.385	353	23	6	98	83	50	88.952	88	57	5.4	0.479	0.4	0.321	15.795	1256.271	GP
	392	81	0	353.529	353	31	44.4	96	69	50	87.026	87	1	31.8	1.085	0.992	0.9	18.450	1256.349	GP
	393	0	0	353.700	353	41	60	96	65	0	86.985	86	59	6	0.524	0.43	0.336	18.748	1256.939	GP
	396	2	0	356.418	356	25	4.8	96	65	50	86.990	86	59	22.2	0.454	0.338	0.22	23.335	1257.271	GP
	398	8	0	358.272	358	16	19.2	93	11	50	83.804	83	48	12.6	1.855	1.808	1.66	19.273	1256.667	GP
	398	10	0	358.290	358	17	24	93	80	0	84.420	84	25	12	0.915	0.767	0.62	29.221	1258.470	GP
	94	41	50	84.974	84	58	24.6	102	59	0	92.331	92	19	51.6	1.794	1.741	1.69	10.383	1254.218	GP
	92	73	50	83.462	83	27	41.4	102	49	0	92.241	92	14	27.6	0.945	0.894	0.843	10.184	1255.089	GP
	40	99	50	36.896	36	53	43.8	97	31	50	87.584	87	35	0.6	1.1	0.995	0.89	20.963	1256.272	vaisi goth

Table 12:Tacheometric Sheet 9M5

Instrument Station: 9M6 RL of Instrument Station: 1255.804 Height of Instrument: 1.522

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance	Reduced Level	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B	m.	m.	
9M5	293	37	50	264.038	264	2	15	101	80	50	91.625	91	37	28.20	1.435	1.321	1.206	22.882	1255.356	road left
	283	18	50	254.867	254	51	59	101	80	0	91.620	91	37	12.00	1.492	1.386	1.28	21.183	1255.341	road right
	276	65	0	248.985	248	59	6	101	80	0	91.620	91	37	12.00	1.728	1.62	1.512	21.583	1255.096	pole
	272	23	50	245.012	245	0	41	101	80	0	91.620	91	37	12.00	1.234	1.185	1.136	9.792	1255.864	road left
	212	59	0	191.331	191	19	52	101	80	0	91.620	91	37	12.00	0.421	0.36	0.298	12.290	1256.618	road junc
	207	35	0	186.615	186	36	54	101	81	0	91.629	91	37	44.40	0.322	0.26	0.198	12.390	1256.714	road junc
	256	75	50	231.080	231	4	46	101	58	0	91.422	91	25	19.20	1.185	1.15	1.115	6.996	1256.002	rj near stn
	243	60	0	219.240	219	14	24	101	37	0	91.233	91	13	58.80	1.176	1.143	1.11	6.597	1256.041	rj near stn
	178	92	0	161.028	161	1	41	93	79	50	84.416	84	24	55.80	1.56	1.475	1.389	16.938	1257.507	road right
	176	91	0	159.219	159	13	8	93	80	50	84.425	84	25	28.20	1.567	1.501	1.435	13.075	1257.101	road left
	165	2	0	148.518	148	31	5	93	80	50	84.425	84	25	28.20	1.305	1.18	1.055	24.764	1258.563	road right
	163	45	0	147.105	147	6	18	93	80	50	84.425	84	25	28.20	1.274	1.182	1.09	18.226	1257.923	road junc
	162	2	0	145.818	145	49	5	93	80	50	84.425	84	25	28.20	1.335	1.238	1.141	19.217	1257.964	road junc
	161	7	50	144.968	144	58	3	95	5	0	85.545	85	32	42.00	0.966	0.821	0.675	28.924	1258.759	road junc
	160	22	50	144.203	144	12	9	94	5	0	84.645	84	38	42.00	0.95	0.801	0.65	29.739	1259.313	road junc
	154	58	50	139.127	139	7	35	92	9	50	82.886	82	53	7.80	1.894	1.752	1.609	28.063	1259.077	road left
	150	76	50	135.689	135	41	19	92	9	50	82.886	82	53	7.80	1.372	1.161	0.948	41.750	1261.376	road right
	145	70	0	131.130	131	7	48	92	9	50	82.886	82	53	7.80	1.381	1.181	0.979	39.583	1261.086	road left
	145	4	50	130.541	130	32	26	91	74	0	82.566	82	33	57.60	1.636	1.432	1.226	40.314	1261.154	road junc
	152	53	50	137.282	137	16	53	91	74	0	82.566	82	33	57.60	1.43	1.22	1.015	40.805	1261.430	road corner
	205	29	0	184.761	184	45	40	99	24	0	89.316	89	18	57.60	1.547	1.421	1.295	25.196	1256.206	footpath
	202	44	0	182.196	182	11	46	98	96	0	89.064	89	3	50.40	1.711	1.58	1.45	26.093	1256.172	footpath cor
	213	96	50	192.569	192	34	7	98	96	50	89.069	89	4	6.60	1.66	1.53	1.4	25.993	1256.219	footpath
	211	28	0	190.152	190	9	7	98	96	50	89.069	89	4	6.60	1.697	1.563	1.428	26.893	1256.200	footpath
	214	83	0	193.347	193	20	49	99	41	0	89.469	89	28	8.40	1.805	1.607	1.45	35.497	1256.048	footpath
	212	91	0	191.619	191	37	8	99	48	50	89.537	89	32	11.40	1.86	1.645	1.43	42.997	1256.029	footpath cor
	208	8	50	187.277	187	16	35	99	2	0	89.118	89	7	4.80	1.648	1.512	1.375	27.294	1256.234	BC
	206	86	50	186.179	186	10	43	98	79	0	88.911	88	54	39.60	1.76	1.595	1.43	32.988	1256.358	BC
	188	42	0	169.578	169	34	41	97	12	50	87.413	87	24	45.00	2.516	2.38	2.243	27.244	1256.177	BC
	124	39	50	111.956	111	57	20	94	52	0	85.068	85	4	4.80	0.866	0.787	0.71	15.485	1257.875	footpath cor
	127	123	0	115.407	115	24	25	94	52	50	85.073	85	4	21.00	0.959	0.875	0.793	16.478	1257.872	footpath cor
	171	0	0	153.900	153	54	0	94	52	50	85.073	85	4	21.00	1.375	1.19	1.005	36.727	1259.302	footpath cor
	169	54	0	152.586	152	35	10	94	12	50	84.713	84	42	45.00	1.652	1.465	1.28	36.884	1259.275	footpath cor
	159	16	0	143.244	143	14	38	92	53	0	83.277	83	16	37.20	1.439	1.2	0.97	46.257	1261.579	footpath cor
	158	4	50	142.241	142	14	26	92	53	0	83.277	83	16	37.20	1.501	1.269	1.035	45.961	1261.475	footpath cor
	129	17	0	116.253	116	15	11	90	61	50	81.554	81	33	12.60	1.82	1.631	1.442	36.984	1261.187	footpath cor
	128	82	0	115.938	115	56	17	61	50	0	55.350	55	21	0.00	1.947	1.754	1.56	26.190	1273.673	footpath cor
	116	59	0	104.931	104	55	52	91	6	0	81.954	81	57	14.40	1.96	1.755	1.55	40.197	1261.253	BC
	116	96	50	105.269	105	16	7	91	6	0	81.954	81	57	14.40	2.729	2.494	2.26	45.981	1261.332	BC
	38	26	50	34.439	34	26	19	98	47	50	88.628	88	37	39.00	1.546	1.53	1.514	3.198	1255.873	footpath cor

Table 13:Tacheometric Sheet 9M6

	13	70	0	12.330	12	19	48	98	47	0	88.623	88	37	22.80	1.553	1.535	1.519	3.398	1255.873	footpath cor
	39	16	0	35.244	35	14	38	98	37	0	88.533	88	31	58.80	1.431	1.421	1.41	2.099	1255.959	BC
	121	48	0	109.332	109	19	55	98	38	50	88.547	88	32	47.40	1.47	1.44	1.41	5.996	1256.038	BC
	42	96	50	38.669	38	40	7	98	40	50	88.565	88	33	52.20	1.579	1.525	1.453	12.592	1256.117	BC
	298	67	0	268.803	268	48	11	101	0	0	90.900	90	54	0.00	1.754	1.632	1.51	24.394	1255.311	agri
	328	15	0	295.335	295	20	6	101	49	50	91.346	91	20	43.80	1.89	1.804	1.715	17.490	1255.111	agri
	366	56	0	329.904	329	54	14	101	49	50	91.346	91	20	43.80	1.955	1.88	1.805	14.992	1255.094	agri
	273	8	50	245.777	245	46	35	103	71	50	93.344	93	20	36.60	0.59	0.445	0.3	28.901	1255.193	footpath cor
	255	22	0	229.698	229	41	53	102	80	0	92.520	92	31	12.00	1.14	0.985	0.83	30.940	1254.979	footpath cor
	247	16	50	222.449	222	26	55	101	83	0	91.647	91	38	49.20	1.482	1.288	1.095	38.668	1254.926	footpath cor
	234	63	0	211.167	211	10	1	90	95	0	81.855	81	51	18.00	2.493	2.273	2.05	43.411	1261.266	footpath cor
	244	64	0	220.176	220	10	34	101	38	0	91.242	91	14	31.20	1.626	1.465	1.305	32.085	1255.165	vegetation
	232	16	0	208.944	208	56	38	101	40	0	91.260	91	15	36.00	1.59	1.445	1.3	28.986	1255.243	vegetation
	21	62	50	19.463	19	27	45	101	41	0	91.269	91	16	8.40	1.89	1.81	1.73	15.992	1255.162	BC
	5	60	0	5.040	5	2	24	101	41	0	91.269	91	16	8.40	1.68	1.6	1.519	16.092	1255.370	BC
	19	99	0	17.991	17	59	28	99	13	0	89.217	89	13	1.20	2.485	2.379	2.271	21.396	1255.239	BC
	0	77	0	0.693	0	41	35	103	56	50	93.209	93	12	30.60	1.058	1.95	0.84	21.732	1254.158	BC
	19	25	0	17.325	17	19	30	99	10	0	89.190	89	11	24.00	2.494	2.386	2.28	21.396	1255.242	BC
	399	18	50	359.267	359	15	59	101	47	0	91.323	91	19	22.80	1.645	1.52	1.395	24.987	1255.229	tree
	31	83	50	28.652	28	39	5	101	6	50	90.959	90	57	30.60	0.555	0.446	0.3	25.493	1256.453	tree
	38	87	0	34.983	34	58	59	97	4	50	87.341	87	20	25.80	2.475	2.27	2.112	36.222	1256.739	BC
	329	85	0	296.865	296	51	54	104	52	0	94.068	94	4	4.80	1.77	1.745	1.719	5.074	1255.220	GP
	327	97	0	295.173	295	10	23	104	52	0	94.068	94	4	4.80	1.299	1.282	1.265	3.383	1255.803	GP
	298	22	50	268.403	268	24	9	105	2	50	94.523	94	31	21.00	1.069	1.043	1.015	5.366	1255.859	GP
	288	1	0	259.209	259	12	32	105	2	50	94.523	94	31	21.00	0.996	0.947	0.899	9.640	1255.617	GP
	296	41	50	266.774	266	46	25	105	2	50	94.523	94	31	21.00	0.711	0.63	0.55	16.000	1255.430	GP
	152	9	50	136.886	136	53	8	105	2	50	94.523	94	31	21.00	0.853	0.819	0.782	7.056	1255.949	GP
	150	3	50	135.032	135	1	53	95	0	0	85.500	85	30	0.00	1.176	1.139	1.1	7.553	1256.781	GP
	148	81	0	133.929	133	55	44	92	36	50	83.129	83	7	42.60	1.691	1.629	1.57	11.927	1257.134	GP
	145	49	0	130.941	130	56	28	95	2	50	85.523	85	31	21.00	0.585	0.523	0.46	12.424	1257.776	GP
	142	97	50	128.678	128	40	39	93	41	0	84.069	84	4	8.40	1.28	1.19	1.1	17.808	1257.986	GP
	142	84	0	128.556	128	33	22	89	94	0	80.946	80	56	45.60	1.93	1.83	1.73	19.505	1258.604	GP
	141	63	0	127.467	127	28	1	91	53	0	82.377	82	22	37.20	1.945	1.82	1.7	24.069	1258.727	GP
	141	21	0	127.089	127	5	20	90	54	50	81.491	81	29	25.80	1.845	1.717	1.59	24.942	1259.341	GP
	140	19	50	126.176	126	10	32	91	0	0	81.900	81	54	0.00	1.882	1.748	1.61	26.660	1259.372	GP
	139	88	0	125.892	125	53	31	90	99	0	81.891	81	53	27.60	1.149	1.009	0.87	27.345	1260.213	GP
	138	46	0	124.614	124	36	50	91	3	0	81.927	81	55	37.20	1.945	1.775	1.61	32.839	1260.209	GP
	138	57	0	124.713	124	42	47	91	2	50	81.923	81	55	21.00	1.166	0.991	0.82	33.917	1261.148	GP
	136	24	50	122.621	122	37	14	90	63	50	81.572	81	34	17.40	2.48	2.265	2.05	42.076	1261.296	GP
	122	76	0	110.484	110	29	2	92	11	0	82.899	82	53	56.40	1.701	1.652	1.604	9.552	1256.864	GP
	124	15	0	111.735	111	44	6	92	11	0	82.899	82	53	56.40	1.675	1.612	1.55	12.309	1257.247	GP
	124	77	0	112.293	112	17	35	92	3	0	82.827	82	49	37.20	1.23	1.165	1.1	12.797	1257.772	GP
	124	60	0	112.140	112	8	24	92	3	50	82.832	82	49	53.40	1.91	1.81	1.71	19.689	1257.992	GP
	124	47	0	112.023	112	1	23	91	83	50	82.652	82	39	5.40	1.301	1.201	1.1	19.771	1258.675	GP
	125	32	0	112.788	112	47	17	91	29	0	82.161	82	9	39.60	1.864	1.741	1.621	23.848	1258.868	GP
	125	14	50	112.631	112	37	50	91	25	50	82.130	82	7	46.20	1.396	1.273	1.15	24.139	1259.390	GP
	125	15	50	112.640	112	38	22	91	12	0	82.008	82	0	28.80	1.775	1.64	1.505	26.478	1259.403	GP
	125	15	50	112.640	112	38	22	91	57	0	82.413	82	24	46.80	0.98	0.84	0.7	27.512	1260.151	GP
	126	91	0	114.219	114	13	8	91	58	0	82.422	82	25	19.20	1.679	1.501	1.331	34.195	1260.374	GP

Tachometric Sheet

Instrument Station: 9M7 RL of Instrument Station: 1253.433 Height of Instrument: 1.490

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance	Reduced Level	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B	m.	m.	
9M6	135	54	50	121.991	121	59	25.8	97	38	0	87.642	87	38	31.2	1.768	1.738	1.712	5.591	1253.415	GP
	135	87	0	122.283	122	16	58.8	102	80	50	92.525	92	31	28.2	1.946	1.916	1.886	5.988	1252.743	GP
	141	43	50	127.292	127	17	29.4	103	86	50	93.479	93	28	42.6	1.931	1.885	1.839	9.166	1252.481	POND
	107	39	0	96.651	96	39	3.6	103	86	50	93.479	93	28	42.6	1.017	0.985	0.953	6.376	1253.550	GP
	109	17	0	98.253	98	15	10.8	103	86	50	93.479	93	28	42.6	1.736	1.698	1.66	7.572	1252.765	GP
	112	80	50	101.525	101	31	28.2	103	86	50	93.479	93	28	42.6	1.571	1.514	1.456	11.458	1252.713	POND
	88	58	0	79.722	79	43	19.2	102	96	0	92.664	92	39	50.4	0.743	0.692	0.641	10.178	1253.757	GP
	87	65	0	78.885	78	53	6	102	96	0	92.664	92	39	50.4	0.373	0.301	0.23	14.269	1253.958	GP
	85	89	0	77.301	77	18	3.6	100	93	50	90.842	90	50	29.4	0.805	0.71	0.615	18.996	1253.934	GP
	87	89	50	79.106	79	6	19.8	100	13	50	90.122	90	7	17.4	0.79	0.612	0.435	35.500	1254.236	BC
	75	1	50	67.514	67	30	48.6	101	33	0	91.197	91	11	49.2	0.531	0.425	0.32	21.091	1254.057	BC
	28	72	0	25.848	25	50	52.8	101	33	0	91.197	91	11	49.2	0.876	0.824	0.771	10.495	1253.880	BC
	20	65	50	18.590	18	35	22.2	101	33	0	91.197	91	11	49.2	0.556	0.512	0.43	12.595	1254.148	BC
	94	33	0	84.897	84	53	49.2	101	33	0	91.197	91	11	49.2	1.679	1.612	1.545	13.394	1253.031	GP
	91	0	0	81.900	81	54	2.04636E-11	101	33	0	91.197	91	11	49.2	0.682	0.586	0.49	19.192	1253.936	GP
	94	67	50	85.208	85	12	27	101	33	0	91.197	91	11	49.2	1.524	1.429	1.33	19.392	1253.089	GP
	95	84	50	86.261	86	15	37.8	101	33	0	91.197	91	11	49.2	0.56	0.44	0.32	23.990	1253.982	GP
	102	87	50	92.588	92	35	15	101	33	0	91.197	91	11	49.2	1.427	1.3	1.171	25.589	1253.088	GP
	101	32	0	91.188	91	11	16.8	100	43	50	90.392	90	23	29.4	0.884	0.735	0.585	29.899	1253.984	T
	106	36	50	95.729	95	43	42.6	100	43	50	90.392	90	23	29.4	1.82	1.67	1.52	29.999	1253.048	GP
	98	34	0	88.506	88	30	21.6	100	43	50	90.392	90	23	29.4	0.775	0.615	0.45	32.498	1254.086	canal bridge
	94	92	0	85.428	85	25	40.8	100	43	50	90.392	90	23	29.4	0.74	0.571	0.404	33.598	1254.122	canal bridge
	96	27	0	86.643	86	38	34.8	100	43	50	90.392	90	23	29.4	0.719	0.545	0.371	34.798	1254.140	canal bridge
	99	65	0	89.685	89	41	6	98	92	50	89.033	89	1	57	1.547	1.38	1.214	33.291	1254.105	canal bridge
	103	19	0	92.871	92	52	15.6	98	92	50	89.033	89	1	57	1.8	1.637	1.473	32.691	1253.838	canal bridge
	102	94	50	92.651	92	39	1.8	98	92	50	89.033	89	1	57	1.63	1.441	1.254	37.589	1254.117	GP
	110	35	0	99.315	99	18	54	102	63	0	92.367	92	22	1.2	0.96	0.785	0.61	34.940	1252.694	GP
	110	39	0	99.351	99	21	3.6	99	63	0	89.667	89	40	1.2	1.255	1.040	0.825	42.999	1254.133	GP
	113	10	0	101.790	101	47	24	100	80	50	90.725	90	43	28.2	1.885	1.68	1.475	40.993	1252.725	GP
	108	94	50	98.051	98	3	1.8	103	5	0	92.745	92	44	42	1.796	1.732	1.668	12.771	1252.579	POND
	108	57	0	97.713	97	42	46.8	104	36	0	93.924	93	55	26.4	0.904	0.801	0.696	20.703	1252.702	POND
	117	61	0	105.849	105	50	56.4	104	36	0	93.924	93	55	26.4	0.665	0.54	0.415	24.883	1252.676	POND
	126	28	50	113.657	113	39	23.4	103	88	0	93.492	93	29	31.2	0.618	0.478	0.339	27.796	1252.749	POND
	170	83	0	153.747	153	44	49.2	103	61	50	93.254	93	15	12.6	1.796	1.732	1.668	12.759	1252.466	POND
	187	67	50	168.908	168	54	27	103	61	50	93.254	93	15	12.6	1.705	1.635	1.565	13.955	1252.495	POND
	183	34	50	165.011	165	0	37.8	103	61	50	93.254	93	15	12.6	1.356	1.328	1.302	5.383	1253.289	tree
	187	49	0	168.741	168	44	27.6	103	61	50	93.254	93	15	12.6	1.364	1.324	1.284	7.974	1253.146	GP
	187	87	0	169.083	169	4	58.8	103	61	50	93.254	93	15	12.6	1.73	1.685	1.64	8.971	1252.728	GP
	199	11	0	179.199	179	11	56.4	103	61	50	93.254	93	15	12.6	1.276	1.225	1.172	10.367	1253.109	GP
	198	39	0	178.551	178	33	3.6	103	61	50	93.254	93	15	12.6	1.349	1.279	1.207	14.154	1252.839	GP
	210	32	50	189.293	189	17	33	103	61	50	93.254	93	15	12.6	0.99	0.895	0.8	18.939	1252.951	RC
	220	59	0	198.531	198	31	51.6	103	61	50	93.254	93	15	12.6	1.001	0.91	0.815	18.540	1252.959	RC
	208	55	0	187.695	187	41	42	103	61	50	93.254	93	15	12.6	1.227	1.179	1.13	9.669	1253.194	RC
	237	73	50	213.962	213	57	41.4	103	61	50	93.254	93	15	12.6	1.194	1.143	1.09	10.367	1253.191	RC
	169	70	50	152.735	152	44	4.2	103	61	50	93.254	93	15	12.6	0.584	0.542	0.5	8.373	1253.905	RC
	387	47	0	348.723	348	43	22.8	103	61	50	93.254	93	15	12.6	0.384	0.432	0.299	8.473	1254.009	RC
	389	64	0	350.676	350	40	33.6	99	41	50	89.474	89	28	24.6	0.48	0.395	0.307	17.299	1254.687	RC
	1	25	0	1.125	1	7	30	99	41	50	89.474	89	28	24.6	0.374	0.824	0.194	17.998	1254.264	RC
	7	50	0	6.750	6	45	0	99	41	50	89.474	89	28	24.6	1.028	0.983	0.939	8.899	1254.022	GP
	6	59	0	5.931	5	55	51.6	98	22	0	88.398	88	23	52.8	0.628	0.555	0.483	14.489	1254.773	GP
	13	57	0	12.213	12	12	46.8	98	22	0	88.398	88	23	52.8	1.4	1.334	1.268	13.190	1253.958	GP
	14	35	0	12.915	12	54	54	98	22	0	88.398	88	23	52.8	1.604	1.516	1.43	17.386	1253.893	GP
	16	20	0	14.580	14	34	48	97	63	0	87.867	87	52	1.2	0.865	0.74	0.615	24.965	1255.113	GP
	238	13	0	214.317	214	19	1.2	106	15	50	95.540	95	32	22.2	1.07	1.007	0.945	12.384	1252.715	Fence
	289	71	50	260.744	260	44	36.6	105	72	50	95.153	95	9	9	1.468	1.42	1.372	9.523	1252.644	GP
	289	14	0	260.226	260	13	33.6	105	78	0	95.202	95	12	7.2	1.08	0.95	0.821	25.687	1251.634	GP
	289	13	50	260.222	260	13	17.4	105	78	50	95.207	95	12	23.4	1.079	0.95	0.82	25.687	1251.632	Fence
	312	93	50	281.642	281	38	29.4	103	76	0	93.384	93	23	2.4	1.71	1.52	1.325	38.366	1251.134	Fence
	342	76	0	308.484	308	29	2.4	97	19	50	87.476	87	28	31.8	1.633	1.58	1.527	10.579	1253.809	Agri
	327	73	0	294.957	294	57	25.2	101	88	0	91.692	91	41	31.2	1.64	1.557	1.474	16.586	1252.876	Agri
	323	30	50	290.975	290	58	28.2	100	12	50	90.113	90	6	45	2.955	2.82	2.685	27.000	1252.050	Agri

Table 14:Tacheometric Sheet 9M7

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey Camp, 2022

Observer: Group 9
Recorder: Group 9
Instrument Theodolite

Date: 23-Aug-22
Weather: Sunny
Temperature: 29°C

Tachometric Sheet

Instrument Station: 9M8 RL of Instrument Station: 1252.633 Height of Instrument: 1.466

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance m.	Reduced Level m.	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B			
CP2	0	42	0	0.378	0	22	40.8	104	50	0	94.050	94	2	60	0.77	0.675	0.58	18.905	1252.085	pond
	64	23	50	57.812	57	48	41.4	104	6	50	93.659	93	39	30.6	0.73	0.625	0.52	20.914	1252.137	pond
	29	9	0	26.181	26	10	51.6	104	48	0	94.032	94	1	55.2	0.995	0.91	0.83	16.418	1252.032	pond
	24	85	0	22.365	22	21	54	104	8	0	93.672	93	40	19.2	1.255	1.2	1.14	11.453	1252.164	pond
	74	22	0	66.798	66	47	52.8	104	9	50	93.686	93	41	7.8	0.935	0.86	0.78	15.436	1252.245	pond
	368	70	50	331.835	331	50	4.2	103	85	0	93.465	93	27	54	0.69	0.59	0.49	19.927	1252.302	pond
	342	26	50	308.039	308	2	18.6	103	86	0	93.474	93	28	26.4	0.83	0.75	0.67	15.941	1252.381	pond
	130	25	0	117.225	117	13	30	103	85	0	93.465	93	27	54	0.78	0.75	0.72	5.978	1252.987	tree
	358	99	0	323.091	323	5	27.6	101	99	50	91.796	91	47	43.8	0.58	0.47	0.36	21.978	1252.940	chautari
	347	92	0	313.128	313	7	40.8	102	0	0	91.800	91	47	60	0.55	0.44	0.33	21.978	1252.968	chautari
	358	40	0	322.560	322	33	36	102	0	0	91.800	91	47	60	0.52	0.4	0.28	23.976	1252.946	chautari
	347	72	0	312.948	312	56	52.8	101	50	0	91.350	91	20	60	1.36	1.24	1.12	23.987	1252.294	chautari
	374	10	0	336.690	336	41	24	102	62	0	92.358	92	21	28.8	0.705	0.59	0.48	22.462	1252.584	banana tree
	336	24	0	302.616	302	36	57.6	101	35	50	91.220	91	13	10.2	0.97	0.86	0.75	21.990	1252.771	banana tree
	390	60	0	351.540	351	32	24	101	15	50	91.040	91	2	22.2	1.33	1.225	1.12	20.993	1252.493	bridge
	397	14	50	357.431	357	25	49.8	101	14	0	91.026	91	1	33.6	1.35	1.25	1.115	23.492	1252.428	bridge
	398	40	0	358.560	358	33	36	100	46	0	90.414	90	24	50.4	1.54	1.435	1.33	20.999	1252.512	bridge
	391	28	0	352.152	352	9	7.2	97	83	0	88.047	88	2	49.2	1.62	1.485	1.34	27.967	1253.568	gp
	4	16	50	3.749	3	44	54.6	100	85	50	90.770	90	46	10.2	1.185	1.05	0.92	26.495	1252.693	tree
	115	78	0	104.202	104	12	7.2	97	70	50	87.935	87	56	4.2	1.325	1.21	1.1	22.471	1253.699	agriculture
	125	91	50	113.324	113	19	24.6	97	53	0	87.777	87	46	37.2	1.665	1.5	1.31	35.447	1253.975	agriculture
	90	76	50	81.689	81	41	18.6	97	54	0	87.786	87	47	9.6	1.6	1.44	1.29	30.954	1253.856	agriculture
	90	76	50	81.689	81	41	18.6	97	53	50	87.782	87	46	53.4	1.41	1.315	1.22	18.972	1253.519	agriculture
	75	84	50	68.261	68	15	37.8	98	10	0	88.290	88	17	24	1.43	1.3	1.17	25.977	1253.575	agriculture
	78	20	0	70.380	70	22	48	98	11	50	88.304	88	18	12.6	1.605	1.415	1.23	37.467	1253.794	gp

Table 15:Tacheometric Sheet 9M8

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey Camp, 2022

Observer: Group 9
Recorder: Group 9
Instrument Theodolite

Date: 23-Aug-22
Weather: Sunny
Temperature 29°C

Tachometric Sheet

Instrument Station: 9M9 RL of Instrument Station: 1252.750 Height of Instrument: 1.478

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance m.	Reduced Level m.	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B			
9M8	33	86	50	30.479	30	28	42.6	100	81	0	90.729	90	43	44.4	0.5	0.31	0.12	37.994	1253.435	building cor
	45	58	50	41.027	41	1	35.4	99	78	50	89.807	89	48	23.4	1.1	0.88	0.665	43.500	1253.495	building cor
	29	18	0	26.262	26	15	43.2	100	26	0	90.234	90	14	2.4	0.735	0.505	0.28	45.499	1253.537	building cor
	33	62	0	30.258	30	15	28.8	100	1	50	90.014	90	0	48.6	1.49	1.31	1.13	36.000	1252.910	football cor
	56	99	50	51.296	51	17	43.8	99	91	0	89.919	89	55	8.4	1.53	1.32	1.11	42.000	1252.967	football cor
	378	50	0	340.650	340	38	60	99	99	0	89.991	89	59	27.6	1.465	1.445	1.43	3.500	1252.784	football cor
	82	92	50	74.633	74	37	57	99	97	0	89.973	89	58	22.8	1.405	1.28	1.15	25.500	1252.960	gp
	117	1	50	105.314	105	18	48.6	100	5	0	90.045	90	2	42	0.94	0.85	0.77	17.000	1253.365	gp
	113	88	50	102.497	102	29	47.4	97	55	50	87.800	87	47	58.2	0.78	0.67	0.56	21.968	1254.402	gp
	111	74	0	100.566	100	33	57.6	94	49	0	85.041	85	2	27.6	0.88	0.75	0.62	25.806	1255.717	gp
	111	67	50	100.508	100	30	27	93	53	0	84.177	84	10	37.2	0.85	0.705	0.56	28.701	1256.450	gp
	120	78	0	108.702	108	42	7.2	90	56	50	81.509	81	30	30.6	1.815	1.63	1.45	35.704	1257.929	gp
	182	63	50	164.372	164	22	17.4	92	75	0	83.475	83	28	30	0.65	0.525	0.4	24.677	1256.526	fence
	180	31	0	162.279	162	16	44.4	93	40	0	84.060	84	3	36	1.105	1	0.9	20.280	1255.338	gp
	178	47	0	160.623	160	37	22.8	93	38	0	84.042	84	2	31.2	1.84	1.75	1.67	16.817	1254.233	gp
	180	47	0	162.423	162	25	22.8	93	38	0	84.042	84	2	31.2	1.68	1.63	1.58	9.892	1253.630	gp
	208	87	0	187.983	187	58	58.8	96	72	0	87.048	87	2	52.8	1.335	1.2	1.06	27.427	1254.442	fence
	202	21	0	181.989	181	59	20.4	96	71	50	87.044	87	2	36.6	1.38	1.285	1.19	18.949	1253.922	gp
	195	50	0	175.950	175	56	60	98	94	50	89.051	89	3	1.8	1.835	1.765	1.7	13.496	1252.687	gp
	192	98	0	173.682	173	40	55.2	99	3	0	89.127	89	7	37.2	0.62	0.585	0.55	6.998	1253.750	gp
	277	35	0	249.615	249	36	54	99	3	0	89.127	89	7	37.2	1.82	1.745	1.67	14.997	1252.712	gp
	318	64	0	286.776	286	46	33.6	99	7	0	89.163	89	9	46.8	0.885	0.85	0.81	7.498	1253.488	gp
	314	62	0	283.158	283	9	28.8	100	44	0	90.396	90	23	45.6	1.895	1.8	1.71	18.499	1252.300	fence
	351	28	0	316.152	316	9	7.2	105	78	50	95.207	95	12	23.4	1.6	1.545	1.49	10.909	1251.689	volleyball
	360	12	0	324.108	324	6	28.8	102	83	50	92.552	92	33	5.4	0.84	0.67	0.5	33.933	1252.046	volleyball
	29	50	0	26.550	26	33	2.558E-12	101	58	0	91.422	91	25	19.2	1.335	1.17	1	33.479	1252.227	volleyball

Table 16:Tacheometric Sheet 9M9

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey Camp, 2022

Observer: Group 9
Recorder: Group 9
Instrument Theodolite

Date: 23-Aug-22
Weather: Sunny
Temperature: 29°C

Tachometric Sheet

Instrument Station: 9M10 RL of Instrument Station: 1256.976 Height of Instrument: 1.374

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance m.	Reduced Level m.	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B			
9M9	72	2	50	64.823	64	49	21	108	24	0	97.416	97	24	57.6	0.9	0.88	0.86	3.933	1256.958	tree
	66	60	0	59.940	59	56	24	108	41	0	97.569	97	34	8.4	1.065	1.01	0.95	11.300	1255.838	store
	78	14	50	70.331	70	19	49.8	108	40	0	97.560	97	33	36	0.605	0.53	0.46	14.249	1255.929	store
	50	61	50	45.554	45	33	12.6	103	97	50	93.578	93	34	39	1.82	1.75	1.68	13.945	1255.728	store
	84	59	0	76.131	76	7	51.6	109	89	0	98.901	98	54	3.6	0.28	0.205	0.13	14.641	1255.852	mesh
	92	75	0	83.475	83	28	30	98	41	0	88.569	88	34	8.4	3.28	3.17	3.07	20.987	1255.704	mesh
	316	82	50	285.143	285	8	33	83	90	0	75.510	75	30	36	1.615	1.57	1.53	7.968	1258.839	gate
	201	60	0	181.440	181	26	24	90	31	50	81.284	81	17	0.6	1.61	1.54	1.47	13.678	1258.907	fence
	187	91	0	169.119	169	7	8.4	95	25	0	85.725	85	43	30	1.53	1.4	1.27	25.856	1258.883	fence
	167	58	50	150.827	150	49	35.4	96	50	0	86.850	86	50	60	1.75	1.585	1.42	32.900	1258.576	farmland
	185	24	0	166.716	166	42	57.6	96	32	0	86.688	86	41	16.8	0.925	0.81	0.69	23.422	1258.895	gp
	182	81	0	164.529	164	31	44.4	96	37	0	86.733	86	43	58.8	1.15	1.07	0.98	16.945	1258.247	gp
	119	30	0	107.370	107	22	12	96	42	0	86.778	86	46	40.8	1.11	1.06	1.02	8.972	1257.795	gp
	140	77	50	126.698	126	41	51	96	45	50	86.810	86	48	34.2	1.86	1.82	1.78	7.975	1256.975	gp
	148	17	0	133.353	133	21	10.8	102	14	0	91.926	91	55	33.6	1.75	1.645	1.54	20.976	1256.000	gp
	146	1	0	131.409	131	24	32.4	101	94	0	91.746	91	44	45.6	0.57	0.405	0.24	32.969	1256.940	gp
	364	18	0	327.762	327	45	43.2	94	19	0	84.771	84	46	15.6	1.92	1.85	1.78	13.884	1257.771	lamp post
	361	80	0	325.620	325	37	12	94	19	0	84.771	84	46	15.6	2.005	1.9	1.79	21.321	1258.401	gp
	367	8	0	330.372	330	22	19.2	98	43	50	88.592	88	35	29.4	1.58	1.4	1.22	35.978	1257.835	gp
	358	65	0	322.785	322	47	6	94	65	50	85.190	85	11	22.2	3.41	3.324	3.06	34.754	1257.951	gp
	372	94	50	335.651	335	39	1.8	101	13	0	91.017	91	1	1.2	1.3	1.06	0.62	67.979	1256.083	gp
	372	28	0	335.052	335	3	7.2	100	11	50	90.104	90	6	12.6	1.35	1.25	1.15	20.000	1257.064	gp
	379	39	50	341.456	341	27	19.8	103	79	0	93.411	93	24	39.6	1.08	1.04	1	7.972	1256.835	gp
	15	91	0	14.319	14	19	8.4	101	95	0	91.755	91	45	18	4.93	4.81	4.7	22.978	1252.836	gp
	392	44	50	353.201	353	12	1.8	102	5	0	91.845	91	50	42	0.675	0.65	0.625	4.995	1257.539	gp
	13	51	0	12.159	12	9	32.4	99	2	50	89.123	89	7	21	4.22	4.12	4.02	19.995	1254.536	gp
	13	68	50	12.317	12	18	59.4	100	41	0	90.369	90	22	8.4	2.61	2.545	2.48	12.999	1255.721	gp
	10	51	50	9.464	9	27	48.6	108	41	50	97.574	97	34	24.6	0.84	0.815	0.79	4.913	1256.882	gp
	393	51	0	354.159	354	9	32.4	100	40	0	90.360	90	21	36	2.55	2.47	2.39	15.999	1255.779	gp
	394	0	0	354.600	354	36	8.1855E-11	104	79	0	94.311	94	18	39.6	3.855	3.73	3.6	25.356	1252.709	gp
	77	90	0	70.110	70	6	36	104	89	0	94.401	94	24	3.6	1.44	1.345	1.25	18.888	1255.551	gp

Table 17:Tacheometric Sheet 9M10

Instrument Station: 9M10 RL of Instrument Station: 1256.976 Height of Instrument: 1.374

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance m.	Reduced Level m.	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B			
9M9	72	2	50	64.823	64	49	21	108	24	0	97.416	97	24	57.6	0.9	0.88	0.86	3.933	1256.958	tree
	66	60	0	59.940	59	56	24	108	41	0	97.569	97	34	8.4	1.065	1.01	0.95	11.300	1255.838	store
	78	14	50	70.331	70	19	49.8	108	40	0	97.560	97	33	36	0.605	0.53	0.46	14.249	1255.929	store
	50	61	50	45.554	45	33	12.6	103	97	50	93.578	93	34	39	1.82	1.75	1.68	13.945	1255.728	store
	84	59	0	76.131	76	7	51.6	109	89	0	98.901	98	54	3.6	0.28	0.205	0.13	14.641	1255.852	mesh
	92	75	0	83.475	83	28	30	98	41	0	88.569	88	34	8.4	3.28	3.17	3.07	20.987	1255.704	mesh
	316	82	50	285.143	285	8	33	83	90	0	75.510	75	30	36	1.615	1.57	1.53	7.968	1258.839	gate
	201	60	0	181.440	181	26	24	90	31	50	81.284	81	17	0.6	1.61	1.54	1.47	13.678	1258.907	fence
	187	91	0	169.119	169	7	8.4	95	25	0	85.725	85	43	30	1.53	1.4	1.27	25.856	1258.883	fence
	167	58	50	150.827	150	49	35.4	96	50	0	86.850	86	50	60	1.75	1.585	1.42	32.900	1258.576	farmland
	185	24	0	166.716	166	42	57.6	96	32	0	86.688	86	41	16.8	0.925	0.81	0.69	23.422	1258.895	gp
	182	81	0	164.529	164	31	44.4	96	37	0	86.733	86	43	58.8	1.15	1.07	0.98	16.945	1258.247	gp
	119	30	0	107.370	107	22	12	96	42	0	86.778	86	46	40.8	1.11	1.06	1.02	8.972	1257.795	gp
	140	77	50	126.698	126	41	51	96	45	50	86.810	86	48	34.2	1.86	1.82	1.78	7.975	1256.975	gp
	148	17	0	133.353	133	21	10.8	102	14	0	91.926	91	55	33.6	1.75	1.645	1.54	20.976	1256.000	gp
	146	1	0	131.409	131	24	32.4	101	94	0	91.746	91	44	45.6	0.57	0.405	0.24	32.969	1256.940	gp
	364	18	0	327.762	327	45	43.2	94	19	0	84.771	84	46	15.6	1.92	1.85	1.78	13.884	1257.771	lamp post
	361	80	0	325.620	325	37	12	94	19	0	84.771	84	46	15.6	2.005	1.9	1.79	21.321	1258.401	gp
	367	8	0	330.372	330	22	19.2	98	43	50	88.592	88	35	29.4	1.58	1.4	1.22	35.978	1257.835	gp
	358	65	0	322.785	322	47	6	94	65	50	85.190	85	11	22.2	3.41	3.324	3.06	34.754	1257.951	gp
	372	94	50	335.651	335	39	1.8	101	13	0	91.017	91	1	1.2	1.3	1.06	0.62	67.979	1256.083	gp
	372	28	0	335.052	335	3	7.2	100	11	50	90.104	90	6	12.6	1.35	1.25	1.15	20.000	1257.064	gp
	379	39	50	341.456	341	27	19.8	103	79	0	93.411	93	24	39.6	1.08	1.04	1	7.972	1256.835	gp
	15	91	0	14.319	14	19	8.4	101	95	0	91.755	91	45	18	4.93	4.81	4.7	22.978	1252.836	gp
	392	44	50	353.201	353	12	1.8	102	5	0	91.845	91	50	42	0.675	0.65	0.625	4.995	1257.539	gp
	13	51	0	12.159	12	9	32.4	99	2	50	89.123	89	7	21	4.22	4.12	4.02	19.995	1254.536	gp
	13	68	50	12.317	12	18	59.4	100	41	0	90.369	90	22	8.4	2.61	2.545	2.48	12.999	1255.721	gp
	10	51	50	9.464	9	27	48.6	108	41	50	97.574	97	34	24.6	0.84	0.815	0.79	4.913	1256.882	gp
	393	51	0	354.159	354	9	32.4	100	40	0	90.360	90	21	36	2.55	2.47	2.39	15.999	1255.779	gp
	394	0	0	354.600	354	36	8.1855E-11	104	79	0	94.311	94	18	39.6	3.855	3.73	3.6	25.356	1252.709	gp
	77	90	0	70.110	70	6	36	104	89	0	94.401	94	24	3.6	1.44	1.345	1.25	18.888	1255.551	gp

Table 18:Tacheometric Sheet 9M10

Instrument Station: 9M11 RL of Instrument Station: 1258.714 Height of Instrument: 1.512

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance	Reduced Level	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B	m.	m.	
9M10	77	85	0	70.065	70	3	54	97	38	0	87.642	87	38	31.2	1.705	1.55	1.395	30.948	1259.950	Hall
	90	45	0	81.405	81	24	18	112	24	0	101.016	101	0	57.6	1.74	1.66	1.585	14.934	1255.659	Hall
	62	95	0	56.655	56	39	18	106	52	0	95.868	95	52	4.8	1.86	1.71	1.57	28.697	1255.567	footpath
	49	63	50	44.672	44	40	17.4	106	52	0	95.868	95	52	4.8	1.965	1.83	1.69	27.213	1255.599	footpath
	48	1	50	43.214	43	12	48.6	108	58	50	97.727	97	43	35.4	1.425	1.3	1.18	24.057	1255.662	footpath
	45	97	0	41.373	41	22	22.8	107	58	50	96.827	96	49	35.4	1.55	1.415	1.28	26.619	1255.624	mesh
	37	20	0	33.480	33	28	48	107	57	0	96.813	96	48	46.8	2.45	2.345	2.24	20.704	1255.407	mesh
	49	95	0	44.955	44	57	18	109	92	50	98.933	98	55	57	1.63	1.535	1.44	18.542	1255.777	tap
	39	98	50	35.987	35	59	11.4	103	73	50	93.362	93	21	41.4	2.87	2.775	2.66	20.928	1256.222	tap
	35	76	0	32.184	32	11	2.4	103	74	50	93.371	93	22	13.8	2.77	2.685	2.58	18.934	1256.426	tap
	1	58	50	1.427	1	25	35.4	104	52	50	94.073	94	4	21	1.655	1.45	1.24	41.291	1255.836	mesh
	4	24	0	3.816	3	48	57.6	104	5	20	93.647	93	38	48.48	1.78	1.59	1.4	37.846	1256.224	mesh
	61	87	50	55.688	55	41	15	106	95	50	96.260	96	15	34.2	1.06	0.89	0.72	33.596	1255.651	pole
	61	5	0	54.945	54	56	42	117	48	0	105.732	105	43	55.2	1.24	1.12	1.15	8.338	1256.757	gp
	61	48	50	55.337	55	20	11.4	111	33	0	100.197	100	11	49.2	0.795	0.68	0.56	22.763	1255.451	gp
	59	99	50	53.996	53	59	43.8	107	8	50	96.377	96	22	35.4	1.21	0.97	0.73	47.408	1253.958	gp
	133	98	0	120.582	120	34	55.2	107	8	50	96.377	96	22	35.4	1.55	1.53	1.505	4.444	1258.199	chilli garden
	203	56	50	183.209	183	12	30.6	107	15	0	96.435	96	26	6	1.51	1.485	1.46	4.937	1258.184	chilli garden
	205	11	50	184.604	184	36	12.6	107	20	0	96.480	96	28	48	1.24	1.21	1.18	5.924	1258.343	chilli garden
	232	50	0	209.250	209	15	0	107	23	0	96.507	96	30	25.2	0.92	0.87	0.82	9.872	1258.230	chilli garden
	282	96	0	254.664	254	39	50.4	107	23	0	96.507	96	30	25.2	0.515	0.465	0.415	9.872	1258.635	farmland
	291	98	0	262.782	262	46	55.2	107	16	0	96.444	96	26	38.4	1.205	1.18	1.16	4.443	1258.544	farmland
	292	32	0	263.088	263	5	16.8	107	15	0	96.435	96	26	6	1.28	1.26	1.24	3.950	1258.521	farmland
	13	62	50	12.263	12	15	45	107	3	50	96.332	96	19	53.4	1.405	1.395	1.39	1.482	1258.667	farmland
	264	46	0	238.014	238	0	50.4	94	50	0	85.050	85	2	60	0.73	0.565	0.4	32.754	1262.498	house cor
	243	23	50	218.912	218	54	41.4	90	65	0	81.585	81	35	6	2.83	2.67	2.51	31.315	1262.189	house cor
	252	16	0	226.944	226	56	38.4	95	27	0	85.743	85	44	34.8	1.36	1.24	1.12	23.868	1260.763	gp
	252	70	0	227.430	227	25	48	95	26	0	85.734	85	44	2.4	1.855	1.750	1.65	20.387	1259.997	gp
	252	25	0	227.025	227	1	30	101	23	50	91.112	91	6	41.4	0.99	1.905	0.82	16.994	1257.991	gp
	253	38	0	228.042	228	2	31.2	101	29	0	91.161	91	9	39.6	1.36	1.325	1.29	6.997	1258.759	gp
	291	88	0	262.692	262	41	31.2	87	73	50	78.962	78	57	41.4	4.85	4.69	4.54	29.864	1261.362	fence
	278	82	0	250.938	250	56	16.8	101	80	0	91.620	91	37	12	1.275	1.23	1.18	9.492	1258.728	gp
	281	15	0	253.035	253	2	6	98	82	50	88.943	88	56	33	1.585	1.495	1.405	17.994	1259.063	gp
	281	33	50	253.202	253	12	5.4	98	73	50	88.862	88	51	41.4	0.835	0.725	0.62	21.492	1259.928	gp
	281	92	0	253.728	253	43	40.8	93	69	50	84.326	84	19	31.8	1.565	1.44	1.31	25.251	1261.295	gp
	129	16	0	116.244	116	14	38.4	105	0	0	94.500	94	30	0	1.405	1.37	1.34	6.460	1258.348	gp
	126	16	0	113.544	113	32	38.4	107	82	0	97.038	97	2	16.8	1.74	1.69	1.64	9.850	1257.320	gp
	128	92	50	116.033	116	1	57	113	4	50	101.741	101	44	25.8	0.83	0.75	0.67	15.338	1256.288	gp
	128	85	0	115.965	115	57	54	108	70	0	97.830	97	49	48	1.14	1.01	0.88	25.517	1255.707	gp
	8	25	0	7.425	7	25	30	108	72	0	97.848	97	50	52.8	1.215	1.18	1.14	7.360	1258.032	gp

Table 19:Tacheometric Sheet 9M11

Instrument Station: 9M12 RL of Instrument Station: 1256.159 Height of Instrument: 1.626

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance	Reduced Level	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B	m.	m.	
9M11	141	27	0	127.143	127	8	34.8	103	24	0	92.916	92	54	57.6	1.64	1.58	1.52	11.969	1255.595	BC
	190	96	0	171.864	171	51	50.4	103	25	0	92.925	92	55	30	1.855	1.82	1.785	6.982	1255.608	BC
	195	5	0	175.545	175	32	42	103	25	0	92.925	92	55	30	1.575	1.51	1.445	12.966	1255.612	BC
	284	25	0	255.825	255	49	30	90	78	0	81.702	81	42	7.2	1.97	1.89	1.81	15.667	1258.180	BC
	289	15	0	260.235	260	14	6	92	76	0	83.484	83	29	2.4	1.925	1.82	1.71	21.223	1258.389	BC
	257	64	0	231.876	231	52	33.6	94	9	0	84.681	84	40	51.6	1.52	1.42	1.32	19.828	1258.211	BC
	285	15	0	256.635	256	38	6	94	10	0	84.690	84	41	24	0.715	0.61	0.585	12.889	1258.373	footpath
	277	78	0	250.002	250	0	7.2	94	11	0	84.699	84	41	56.4	1.085	1.035	0.985	9.915	1257.670	footpath
	290	58	0	261.522	261	31	19.2	94	11	0	84.699	84	41	56.4	1.915	1.89	1.86	5.453	1256.401	footpath
	146	59	0	131.931	131	55	51.6	103	75	0	93.375	93	22	30	1.535	1.493	1.46	7.474	1255.851	footpath
	102	88	50	92.597	92	35	47.4	104	6	0	93.654	93	39	14.4	1.37	1.305	1.24	12.947	1255.653	footpath
	71	62	50	64.463	64	27	45	104	5	0	93.645	93	38	42	1.04	0.94	0.85	18.923	1255.640	footpath
	65	25	0	58.725	58	43	30	104	5	0	93.645	93	38	42	0.78	0.665	0.55	22.907	1255.661	hall corner
	15	84	0	14.256	14	15	21.6	104	69	0	94.221	94	13	15.6	0.26	0.15	0.05	20.886	1256.094	hall corner
	99	2	0	89.118	89	7	4.8	104	69	0	94.221	94	13	15.6	1.67	1.53	1.4	26.854	1254.273	toilet
	99	84	50	89.861	89	51	37.8	104	65	0	94.185	94	11	6	1.72	1.58	1.4	31.830	1253.876	toilet
	87	86	50	79.079	79	4	42.6	104	50	0	94.050	94	2	60	1.79	1.65	1.52	26.865	1254.233	toilet
	394	65	0	355.185	355	11	6	104	49	50	94.046	94	2	43.8	0.625	0.56	0.495	12.935	1256.310	temple
	386	81	0	348.129	348	7	44.4	104	48	0	94.032	94	1	55.2	0.86	0.81	0.76	9.951	1256.274	temple
	369	70	50	332.735	332	44	4.2	104	47	50	94.028	94	1	39	0.655	0.6	0.545	10.946	1256.414	temple
	138	30	0	124.470	124	28	12	106	5	50	95.450	95	26	58.2	0.8	0.75	0.65	14.865	1255.617	footpath
	212	43	50	191.192	191	11	29.4	103	68	50	93.317	93	18	59.4	0.99	0.895	0.8	18.936	1255.793	farmland
	196	98	0	177.282	177	16	55.2	102	50	0	92.250	92	15	0	1.31	1.22	1.125	18.471	1255.839	farmland
	199	86	0	179.874	179	52	26.4	97	34	0	87.606	87	36	21.6	3.33	3.17	3.01	31.944	1255.951	farmland
	86	61	50	77.954	77	57	12.6	101	80	0	91.620	91	37	12	1.905	1.79	1.68	22.482	1255.359	road
	108	88	0	97.992	97	59	31.2	104	47	0	94.023	94	1	22.8	1.465	1.36	1.26	20.399	1254.990	road
	129	60	0	116.640	116	38	24	104	10	0	93.690	93	41	24	1.39	1.25	1.12	26.888	1254.801	road
	132	12	50	118.913	118	54	45	104	22	0	93.798	93	47	52.8	1.56	1.435	1.31	24.890	1254.698	road
	107	87	0	97.083	97	4	58.8	104	23	0	93.807	93	48	25.2	1.7	1.655	1.61	8.960	1255.534	badminton
	84	12	0	75.708	75	42	28.8	109	77	50	98.798	98	47	51	1.76	1.745	1.725	3.418	1255.511	badminton
	58	94	0	53.046	53	2	45.6	104	49	50	94.046	94	2	43.8	1.04	0.955	0.87	16.915	1255.634	badminton
	37	48	0	33.732	33	43	55.2	104	51	0	94.059	94	3	32.4	1.19	1.115	1.04	14.925	1255.611	badminton
	227	81	0	205.029	205	1	44.4	96	37	50	86.738	86	44	15	1.24	1.04	0.95	28.906	1258.393	GP
	229	58	0	206.622	206	37	19.2	96	41	50	86.774	86	46	24.6	0.935	0.82	0.7	23.426	1258.286	GP
	231	84	0	208.656	208	39	21.6	96	48	0	86.832	86	49	55.2	1.41	1.325	1.24	16.948	1257.398	GP
	231	61	0	208.449	208	26	56.4	96	64	0	86.976	86	58	33.6	1.915	1.85	1.78	13.462	1256.646	GP
	232	7	0	208.863	208	51	46.8	109	72	54	98.753	98	45	10.296	1.02	0.98	0.94	7.815	1255.602	GP
	216	20	0	194.580	194	34	48	101	26	0	91.134	91	8	2.4	1.305	1.21	1.11	19.492	1256.189	GP

Table 20:Tacheometric Sheet 9M12

Tachometric Sheet

Instrument Station: 9M13 RL of Instrument Station: 1260.864 Height of Instrument: 1.516

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance m.	Reduced Level m.	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B			
9M12	53	25	0	47.925	47	55	30	100	55	0	90.495	90	29	42	0.78	0.56	0.64	13.999	1261.699	bc
	64	78	0	58.302	58	18	7.2	99	30	0	89.370	89	22	12	1.92	1.69	1.46	45.994	1261.196	bc
	51	83	0	46.647	46	38	49.2	100	7	50	90.068	90	4	3	1.435	1.19	0.94	49.500	1261.132	bc
	147	79	0	133.011	133	0	39.6	93	19	50	83.876	83	52	31.8	1.23	1.14	1.05	17.795	1263.149	road
	147	50	0	132.750	132	45	0	93	3	50	83.732	83	43	53.4	1.42	1.325	1.23	18.773	1263.117	road
	83	11	50	74.804	74	48	12.6	103	17	0	92.853	92	51	10.8	0.725	0.66	0.59	13.467	1261.049	bc
	104	17	50	93.758	93	45	27	101	15	0	91.035	91	2	6	0.94	0.86	0.78	15.995	1261.231	bc
	74	26	50	66.839	66	50	18.6	101	15	0	91.035	91	2	6	1.02	0.91	0.8	21.993	1261.073	bc
	132	39	0	119.151	119	9	3.6	93	62	0	84.258	84	15	28.8	1.395	1.28	1.16	23.265	1263.439	road
	134	19	0	120.771	120	46	15.6	93	63	50	84.272	84	16	17.4	1.38	1.26	1.14	23.761	1263.504	road
	132	39	0	119.151	119	9	3.6	93	63	50	84.272	84	16	17.4	0.72	0.555	0.47	24.751	1264.308	road
	131	29	0	118.161	118	9	39.6	91	82	0	82.638	82	38	16.8	1.67	1.54	1.42	24.590	1264.017	road
	65	25	0	58.725	58	43	30	99	94	50	89.951	89	57	1.8	1.575	1.47	1.36	21.500	1260.929	road
	66	69	0	60.021	60	1	15.6	99	94	50	89.951	89	57	1.8	1.575	1.46	1.35	22.500	1260.939	road
	52	90	0	47.610	47	36	36	101	40	50	91.265	91	15	52.2	0.79	0.62	0.45	33.983	1261.010	road
	52	65	50	47.390	47	23	22.2	101	41	0	91.269	91	16	8.4	0.62	0.44	0.26	35.982	1261.143	road
	42	44	0	38.196	38	11	45.6	103	41	0	93.069	93	4	8.4	0.95	0.775	0.6	34.900	1259.734	road
	41	31	50	37.184	37	11	0.6	103	27	50	92.948	92	56	51	1.24	1.07	0.9	33.910	1259.564	road
	30	75	50	27.680	27	40	46.2	105	81	50	95.234	95	14	0.6	0.765	0.58	0.4	36.196	1258.485	bc
	22	11	50	19.904	19	54	12.6	104	57	50	94.118	94	7	3	1.375	1.18	0.98	39.296	1258.371	bc
	35	38	0	31.842	31	50	31.2	103	50	0	93.150	93	9	2E-11	1.69	1.47	1.25	43.867	1258.496	bc
	60	4	0	54.036	54	2	9.6	100	15	0	90.135	90	8	6	1.34	1.16	0.98	36.000	1261.135	footpath
	60	4	0	54.036	54	2	9.6	99	90	50	89.915	89	54	52.2	1.46	1.28	1.1	36.000	1261.154	footpath
	375	44	50	337.901	337	54	1.8	106	78	50	96.107	96	6	23.4	2.32	2.235	2.15	16.808	1258.347	farmland
	378	60	0	340.740	340	44	24	106	99	50	96.296	96	17	43.8	1.84	1.73	1.62	21.735	1258.252	farmland
	330	60	0	297.540	297	32	24	106	99	0	96.291	96	17	27.6	1.32	1.19	1.06	25.688	1258.358	farmland
	318	5	0	286.245	286	14	42	104	70	0	94.230	94	13	48	1.42	1.26	1.1	31.826	1258.766	farmland
	310	73	50	279.662	279	39	41.4	102	22	50	92.003	92	0	9	2.01	1.780	1.55	45.944	1258.994	gp
	327	3	0	294.327	294	19	37.2	105	13	0	94.617	94	37	1.2	1.1	0.93	0.76	33.780	1258.722	gp
	142	64	0	128.376	128	22	33.6	104	18	50	93.767	93	45	59.4	0.58	0.55	0.52	5.974	1261.437	gp
	145	20	0	130.680	130	40	48	94	58	0	85.122	85	7	19.2	0.705	0.63	0.56	14.395	1262.979	gp
	106	64	0	95.976	95	58	33.6	95	9	0	85.581	85	34	51.6	1.96	1.915	1.87	8.947	1261.156	gp
	113	9	0	101.781	101	46	51.6	95	14	0	85.626	85	37	33.6	1.54	1.415	1.29	24.855	1262.866	gp
	113	98	50	102.587	102	35	11.4	94	73	0	85.257	85	15	25.2	0.745	0.585	0.43	31.285	1264.391	gp
	47	31	0	42.579	42	34	44.4	105	5	0	94.545	94	32	42	1.13	1.035	0.94	18.881	1259.844	gp
	42	59	0	38.331	38	19	51.6	104	20	0	93.780	93	46	48	1.59	1.46	1.33	25.887	1259.210	gp
	41	83	50	37.652	37	39	5.4	102	65	0	92.385	92	23	6	1.625	1.45	1.27	35.439	1259.454	gp
	37	35	0	33.615	33	36	54	102	64	0	92.376	92	22	33.6	2.3	2.08	1.66	63.890	1257.649	gp
	16	22	50	14.603	14	36	9	104	21	50	93.794	93	47	36.6	1.815	1.63	1.44	37.336	1258.274	gp

Table 21:Tacheometric Sheet 9M13

Instrument Station: 9M13 RL of Instrument Station: 1260.864 Height of Instrument: 1.516

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance m.	Reduced Level m.	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B			
9M12	53	25	0	47.925	47	55	30	100	55	0	90.495	90	29	42	0.78	0.56	0.64	13.999	1261.699	bc
	64	78	0	58.302	58	18	7.2	99	30	0	89.370	89	22	12	1.92	1.69	1.46	45.994	1261.196	bc
	51	83	0	46.647	46	38	49.2	100	7	50	90.068	90	4	3	1.435	1.19	0.94	49.500	1261.132	bc
	147	79	0	133.011	133	0	39.6	93	19	50	83.876	83	52	31.8	1.23	1.14	1.05	17.795	1263.149	road
	147	50	0	132.750	132	45	0	93	3	50	83.732	83	43	53.4	1.42	1.325	1.23	18.773	1263.117	road
	83	11	50	74.804	74	48	12.6	103	17	0	92.853	92	51	10.8	0.725	0.66	0.59	13.467	1261.049	bc
	104	17	50	93.758	93	45	27	101	15	0	91.035	91	2	6	0.94	0.86	0.78	15.995	1261.231	bc
	74	26	50	66.839	66	50	18.6	101	15	0	91.035	91	2	6	1.02	0.91	0.8	21.993	1261.073	bc
	132	39	0	119.151	119	9	3.6	93	62	0	84.258	84	15	28.8	1.395	1.28	1.16	23.265	1263.439	road
	134	19	0	120.771	120	46	15.6	93	63	50	84.272	84	16	17.4	1.38	1.26	1.14	23.761	1263.504	road
	132	39	0	119.151	119	9	3.6	93	63	50	84.272	84	16	17.4	0.72	0.555	0.47	24.751	1264.308	road
	131	29	0	118.161	118	9	39.6	91	82	0	82.638	82	38	16.8	1.67	1.54	1.42	24.590	1264.017	road
	65	25	0	58.725	58	43	30	99	94	50	89.951	89	57	1.8	1.575	1.47	1.36	21.500	1260.929	road
	66	69	0	60.021	60	1	15.6	99	94	50	89.951	89	57	1.8	1.575	1.46	1.35	22.500	1260.939	road
	52	90	0	47.610	47	36	36	101	40	50	91.265	91	15	52.2	0.79	0.62	0.45	33.983	1261.010	road
	52	65	50	47.390	47	23	22.2	101	41	0	91.269	91	16	8.4	0.62	0.44	0.26	35.982	1261.143	road
	42	44	0	38.196	38	11	45.6	103	41	0	93.069	93	4	8.4	0.95	0.775	0.6	34.900	1259.734	road
	41	31	50	37.184	37	11	0.6	103	27	50	92.948	92	56	51	1.24	1.07	0.9	33.910	1259.564	road
	30	75	50	27.680	27	40	46.2	105	81	50	95.234	95	14	0.6	0.765	0.58	0.4	36.196	1258.485	bc
	22	11	50	19.904	19	54	12.6	104	57	50	94.118	94	7	3	1.375	1.18	0.98	39.296	1258.371	bc
	35	38	0	31.842	31	50	31.2	103	50	0	93.150	93	9	2E-11	1.69	1.47	1.25	43.867	1258.496	bc
	60	4	0	54.036	54	2	9.6	100	15	0	90.135	90	8	6	1.34	1.16	0.98	36.000	1261.135	footpath
	60	4	0	54.036	54	2	9.6	99	90	50	89.915	89	54	52.2	1.46	1.28	1.1	36.000	1261.154	footpath
	375	44	50	337.901	337	54	1.8	106	78	50	96.107	96	6	23.4	2.32	2.235	2.15	16.808	1258.347	farmland
	378	60	0	340.740	340	44	24	106	99	50	96.296	96	17	43.8	1.84	1.73	1.62	21.735	1258.252	farmland
	330	60	0	297.540	297	32	24	106	99	0	96.291	96	17	27.6	1.32	1.19	1.06	25.688	1258.358	farmland
	318	5	0	286.245	286	14	42	104	70	0	94.230	94	13	48	1.42	1.26	1.1	31.826	1258.766	farmland
	310	73	50	279.662	279	39	41.4	102	22	50	92.003	92	0	9	2.01	1.780	1.55	45.944	1258.994	gp
	327	3	0	294.327	294	19	37.2	105	13	0	94.617	94	37	1.2	1.1	0.93	0.76	33.780	1258.722	gp
	142	64	0	128.376	128	22	33.6	104	18	50	93.767	93	45	59.4	0.58	0.55	0.52	5.974	1261.437	gp
	145	20	0	130.680	130	40	48	94	58	0	85.122	85	7	19.2	0.705	0.63	0.56	14.395	1262.979	gp
	106	64	0	95.976	95	58	33.6	95	9	0	85.581	85	34	51.6	1.96	1.915	1.87	8.947	1261.156	gp
	113	9	0	101.781	101	46	51.6	95	14	0	85.626	85	37	33.6	1.54	1.415	1.29	24.855	1262.866	gp
	113	98	50	102.587	102	35	11.4	94	73	0	85.257	85	15	25.2	0.745	0.585	0.43	31.285	1264.391	gp
	47	31	0	42.579	42	34	44.4	105	5	0	94.545	94	32	42	1.13	1.035	0.94	18.881	1259.844	gp
	42	59	0	38.331	38	19	51.6	104	20	0	93.780	93	46	48	1.59	1.46	1.33	25.887	1259.210	gp
	41	83	50	37.652	37	39	5.4	102	65	0	92.385	92	23	6	1.625	1.45	1.27	35.439	1259.454	gp
	37	35	0	33.615	33	36	54	102	64	0	92.376	92	22	33.6	2.3	2.08	1.66	63.890	1257.649	gp
	16	22	50	14.603	14	36	9	104	21	50	93.794	93	47	36.6	1.815	1.63	1.44	37.336	1258.274	gp

Table 22:Tacheometric Sheet 9M13

Instrument Station: 9M14 RL of Instrument Station: 1265.773 Height of Instrument:

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle (Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance	HI, m	Reduced Level	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B	m.		m.	
9M13	48	37	50	43.538	43	32	15	107	4	0	96.336	96	20	9.6	1.435	1.375	1.315	11.854	1.418	1264.500	Road Corner
	49	69	50	44.726	44	43	31.8	106	57	0	95.913	95	54	46.8	1.374	1.307	1.24	13.258	1.418	1264.511	Road Corner
	53	19	50	47.876	47	52	31.8	106	58	0	95.922	95	55	19.2	1.436	1.373	1.31	12.466	1.418	1264.525	Building Corner
	39	61	0	35.649	35	38	56.4	106	59	0	95.931	95	55	51.6	0.695	0.593	0.49	20.281	1.418	1264.491	Building Corner
	57	9	0	51.381	51	22	51.6	93	74	50	84.371	84	22	13.8	4.663	4.566	4.47	19.114	1.418	1264.509	Building Corner
	51	43	50	46.292	46	17	29.4	95	0	0	85.500	85	30	0	4.58	4.47	4.36	21.865	1.418	1264.442	Building Corner
	37	67	0	33.903	33	54	10.8	105	75	0	95.175	95	10	30	0.885	0.783	0.68	20.333	1.418	1264.566	Road Junction
	34	81	0	31.329	31	19	44.4	105	77	50	95.198	95	11	51	0.903	0.802	0.7	20.133	1.418	1264.558	Road Junction
	19	31	50	17.384	17	23	0.6	105	76	50	95.189	95	11	18.6	0.95	0.85	0.75	19.836	1.418	1264.540	Road Junction
	18	48	0	16.632	16	37	55.2	105	75	0	95.175	95	10	30	0.864	0.76	0.655	20.730	1.418	1264.554	Road Junction
	15	26	0	13.734	13	44	2.4	105	71	50	95.144	95	8	36.6	0.915	0.815	0.71	20.335	1.418	1264.546	Road Junction
	4	2	0	3.618	3	37	4.8	106	21	0	95.589	95	35	20.4	0.535	0.415	0.295	23.772	1.418	1264.450	Road Junction
	1	3	0	0.927	0	55	37.2	106	22	0	95.598	95	35	52.8	0.566	0.448	0.33	23.375	1.418	1264.452	Road Junction
	3	40	0	3.060	3	3	36	106	22	0	95.598	95	35	52.8	0.6	0.485	0.37	22.781	1.418	1264.473	Road Junction
	2	22	0	1.998	1	59	52.8	108	46	50	97.619	97	37	6.6	0.454	0.361	0.27	18.077	1.418	1264.412	Road Junction
	398	96	0	359.064	359	3	50.4	108	49	0	97.641	97	38	27.6	0.431	0.341	0.25	17.780	1.418	1264.465	Road Junction
	2	64	50	2.381	2	22	49.8	107	20	0	96.480	96	28	48	0.694	0.6	0.505	18.659	1.418	1264.472	Road Junction
	399	83	50	359.852	359	51	5.4	107	23	50	96.512	96	30	41.4	0.899	0.83	0.76	13.721	1.418	1264.795	Road Junction
	396	1	0	356.409	356	24	32.4	107	93	0	97.137	97	8	13.2	0.695	0.623	0.55	14.276	1.418	1264.780	Road Corner
	372	63	50	335.372	335	22	17.4	110	19	50	99.176	99	10	31.8	0.661	0.601	0.54	11.792	1.418	1264.685	Road Corner
	375	55	50	338.000	337	59	58.2	110	20	0	99.180	99	10	48	0.737	0.68	0.624	11.012	1.418	1264.731	Road Corner
	340	90	0	306.810	306	48	36	113	95	0	102.555	102	33	18	0.471	0.431	0.39	7.717	1.418	1265.041	Stairs
	345	12	0	310.608	310	36	28.8	107	13	50	96.422	96	25	17.4	1.471	1.435	1.4	7.011	1.418	1264.967	Stairs
	320	35	0	288.315	288	18	54	107	150	0	97.650	97	39	2E-11	0.292	0.256	0.22	7.072	1.418	1265.985	Stairs
	320	86	0	288.774	288	46	26.4	107	0	50	96.305	96	18	16.2	0.386	0.356	0.325	6.026	1.418	1266.169	Stairs
	325	59	0	293.031	293	1	51.6	107	18	0	96.462	96	27	43.2	0.521	0.488	0.455	6.516	1.418	1265.965	Stairs
	329	97	0	296.973	296	58	22.8	107	18	0	96.462	96	27	43.2	0.788	0.754	0.72	6.714	1.418	1265.677	Stairs
	337	41	0	303.669	303	40	8.4	107	22	0	96.498	96	29	52.8	0.906	0.87	0.835	7.009	1.418	1265.523	Stairs
	300	49	0	270.441	270	26	27.6	107	89	0	97.101	97	6	3.6	0.241	0.203	0.165	7.484	1.418	1266.056	Road Turning
	296	90	0	267.210	267	12	36	106	57	0	95.913	95	54	46.8	0.125	0.08	0.035	8.904	1.418	1266.189	Road Turning
	226	8	0	203.472	203	28	19.2	95	87	0	86.283	86	16	58.8	1.969	1.894	1.82	14.837	1.418	1266.261	Road End
	238	78	0	214.902	214	54	7.2	95	98	50	86.387	86	23	11.4	1.954	1.877	1.8	15.339	1.418	1266.283	Road End
	242	88	50	218.597	218	35	47.4	96	17	0	86.553	86	33	10.8	1.897	1.825	1.75	14.647	1.418	1266.248	Building Corner
	240	16	0	216.144	216	8	38.4	96	40	50	86.765	86	45	52.2	1.804	1.787	1.71	9.370	1.418	1265.934	Building Slab
	246	20	0	221.580	221	34	48	96	56	50	86.909	86	54	30.6	1.898	1.814	1.73	16.751	1.418	1266.282	Building Slab
	258	70	50	232.835	232	50	4.2	87	42	0	78.678	78	40	40.8	4.735	4.638	4.54	18.748	1.418	1266.307	Building Corner
	280	92	50	252.833	252	49	57	104	31	50	93.884	93	53	0.6	0.466	0.418	0.37	9.556	1.418	1266.124	Building Corner
	288	5	0	259.245	259	14	42	101	80	0	91.620	91	37	12	0.572	0.5	0.425	14.688	1.418	1266.276	Building Corner
	305	28	0	274.752	274	45	7.2	101	81	50	91.634	91	38	0.6	1.191	1.116	1.04	15.088	1.418	1265.645	Tree
	319	74	0	287.766	287	45	57.6	101	82	0	91.638	91	38	16.8	1.369	1.282	1.195	17.386	1.418	1265.412	Farmland
	301	64	0	271.476	271	28	33.6	101	87	50	91.688	91	41	15	1.326	1.238	1.15	17.585	1.418	1265.435	Farmland
	297	90	0	268.110	268	6	36	96	60	0	86.940	86	56	24	2.809	2.72	2.63	17.849	1.418	1265.425	Farmland
	290	16	0	261.144	261	8	38.4	96	59	50	86.936	86	56	7.8	2.829	2.734	2.64	18.846	1.418	1265.466	Farmland
	301	2	50	270.923	270	55	21	96	72	0	87.048	87	2	52.8	3.541	3.37	3.2	34.010	1.418	1265.575	Farmland
	317	3	50	285.332	285	19	53.4	97	41	50	87.674	87	40	24.6	2.974	2.806	2.64	33.345	1.418	1265.740	Farmland
	326	25	0	293.625	293	37	30	98	87	0	88.983	88	58	58.8	2.285	2.16	1.935	34.989	1.418	1265.652	Fence

Table 23:Tacheometric Sheet 9M14

Instrument Station: CP2 RL of Instrument Station: 1253.421 Height of Instrument: 1.160

object	Horizontal Angle (Grade)			HA in degree	Horizontal Angle			Vertical Angle(Grade)			VA in degree	Vertical Angle			Stadia Reading, m.			Horizontal Distance m.	Reduced Level m.	Remarks
	G	CG	CCG		D	M	S	G	CG	CCG		D	M	S	T	M	B			
9M7	365	64	0	329.076	329	4	33.6	100	95	0	90.855	90	51	18	0.642	0.572	0.502	13.997	1253.800	white tree
	368	91	50	332.024	332	1	24.6	100	95	0	90.855	90	51	18	0.639	0.58	0.521	11.797	1253.825	tree
	374	42	0	336.978	336	58	40.8	100	95	0	90.855	90	51	18	0.853	0.81	0.767	8.598	1253.643	pole
	341	48	50	307.337	307	20	11.4	100	95	0	90.855	90	51	18	0.86	0.815	0.769	9.098	1253.630	white tree
	8	75	0	7.875	7	52	30	100	95	0	90.855	90	51	18	1.054	1.027	1.001	5.299	1253.475	tree
	46	5	0	41.445	41	26	42	100	95	0	90.855	90	51	18	1.09	1.067	1.042	4.799	1253.442	tree
	333	19	50	299.876	299	52	31.8	100	95	0	90.855	90	51	18	1.075	1.048	1.021	5.399	1253.452	tree
	302	15	0	271.935	271	56	6	100	95	0	90.855	90	51	18	1.338	1.324	1.31	2.799	1253.215	tree
	70	53	0	63.477	63	28	37.2	100	95	0	90.855	90	51	18	1.124	1.106	1.087	3.699	1253.420	tree
	149	49	50	134.546	134	32	43.8	100	95	0	90.855	90	51	18	1.116	1.086	1.056	5.999	1253.405	GP
	112	74	50	101.471	101	28	13.8	100	95	0	90.855	90	51	18	1.13	1.099	1.067	6.299	1253.388	tree
	126	80	50	114.125	114	7	28.2	100	95	0	90.855	90	51	18	1.048	1.003	0.958	8.998	1253.444	tree
	165	41	0	148.869	148	52	8.4	100	95	0	90.855	90	51	18	1.083	1.04	0.997	8.598	1253.413	tree
	147	54	0	132.786	132	47	9.6	100	95	0	90.855	90	51	18	1.043	0.992	0.941	10.198	1253.437	Chautari
	139	12	50	125.213	125	12	45	100	95	0	90.855	90	51	18	1	0.945	0.889	11.098	1253.470	Chautari
	136	58	0	122.922	122	55	19.2	100	95	0	90.855	90	51	18	0.938	0.87	0.802	13.597	1253.508	Chautari
	147	80	0	133.020	133	1	12	91	61	50	82.454	82	27	12.6	1.117	1.042	0.966	14.840	1255.505	Chautari
	151	66	0	136.494	136	29	38.4	91	61	50	82.454	82	27	12.6	1.168	1.089	1.009	15.626	1255.562	Chautari
	161	62	50	145.463	145	27	45	91	61	50	82.454	82	27	12.6	1.228	1.157	1.085	14.053	1255.286	Chautari
	161	42	50	145.283	145	16	57	91	61	50	82.454	82	27	12.6	1.348	1.291	1.234	11.203	1254.774	Chautari
	364	11	0	327.699	327	41	56.4	91	61	50	82.454	82	27	12.6	1.235	1.155	1.075	15.724	1255.509	RB1 R
	350	39	50	315.356	315	21	19.8	91	61	50	82.454	82	27	12.6	1.452	1.374	1.296	15.331	1255.238	RB2 L
	362	83	0	326.547	326	32	49.2	91	61	50	82.454	82	27	12.6	1.801	1.712	1.622	17.591	1255.199	RB3 R
	349	80	50	314.825	314	49	28.2	91	61	50	82.454	82	27	12.6	1.851	1.766	1.682	16.609	1255.015	RB4 L
	362	92	0	326.628	326	37	40.8	100	38	0	90.342	90	20	31.2	1.896	1.798	1.7	19.599	1252.666	RB5 R
	351	79	50	316.616	316	36	55.8	100	38	0	90.342	90	20	31.2	1.874	1.78	1.684	18.999	1252.688	RB6 L
	354	87	50	319.388	319	23	15	100	38	0	90.342	90	20	31.2	1.968	1.864	1.758	20.999	1252.592	RB7 L
	357	68	0	321.912	321	54	43.2	100	38	0	90.342	90	20	31.2	1.801	1.693	1.585	21.599	1252.759	ROAD COR
	367	88	0	331.092	331	5	31.2	100	38	0	90.342	90	20	31.2	1.694	1.611	1.528	16.599	1252.871	BELOW 1
	376	78	50	339.107	339	6	23.4	100	38	0	90.342	90	20	31.2	1.785	1.718	1.652	13.300	1252.784	BELOW PATH
	388	69	50	349.826	349	49	31.8	100	38	0	90.342	90	20	31.2	1.879	1.828	1.776	10.300	1252.692	BELOW PATH
	19	56	0	17.604	17	36	14.4	100	38	0	90.342	90	20	31.2	1.867	1.834	1.801	6.600	1252.708	BELOW PATH
	54	65	0	49.185	49	11	6	100	38	0	90.342	90	20	31.2	1.826	1.797	1.767	5.900	1252.749	BELOW PATH
	101	88	50	91.697	91	41	47.4	100	38	0	90.342	90	20	31.2	1.765	1.725	1.685	8.000	1252.808	BELOW PATH
	123	36	50	111.029	111	1	42.6	100	38	0	90.342	90	20	31.2	1.758	1.702	1.646	11.200	1252.812	BELOW PATH
	111	67	0	100.503	100	30	10.8	102	32	50	92.093	92	5	33	1.54	1.473	1.406	13.382	1252.619	BELOW PATH
	94	12	0	84.708	84	42	28.8	102	32	50	92.093	92	5	33	1.63	1.568	1.506	12.383	1252.561	CORNER 1
	85	56	50	77.009	77	0	30.6	102	32	50	92.093	92	5	33	1.666	1.589	1.512	15.379	1252.430	R N P
	57	25	50	51.530	51	31	46.2	102	32	50	92.093	92	5	33	1.402	1.334	1.264	13.782	1252.743	R N P
	79	36	0	71.424	71	25	26.4	102	32	50	92.093	92	5	33	1.509	1.418	1.327	18.176	1252.499	R N P
	68	28	0	61.452	61	27	7.2	102	32	50	92.093	92	5	33	1.364	1.276	1.187	17.676	1252.659	R N P
	75	37	0	67.833	67	49	58.8	102	32	50	92.093	92	5	33	1.504	1.39	1.276	22.770	1252.359	R N P
	66	72	50	60.053	60	3	9	102	32	50	92.093	92	5	33	1.251	1.139	1.025	22.570	1252.617	R N P
	72	53	0	65.277	65	16	37.2	102	32	50	92.093	92	5	33	1.36	1.23	1.1	25.965	1252.402	R N P
	63	84	50	57.461	57	27	37.8	104	70	0	94.230	94	13	48	0.624	0.526	0.429	19.394	1252.621	TREE
	72	67	0	65.403	65	24	10.8	101	25	0	91.125	91	7	30	1.67	1.511	1.355	31.488	1252.452	CORNER 2
	62	54	0	56.286	56	17	9.6	101	25	0	91.125	91	7	30	1.765	1.68	1.595	16.993	1252.567	POND 1
	53	27	0	47.943	47	56	34.8	101	25	0	91.125	91	7	30	1.776	1.713	1.65	12.595	1252.621	POND 2
	30	43	50	27.392	27	23	29.4	101	25	0	91.125	91	7	30	1.78	1.73	1.68	9.996	1252.655	POND 3
	3	37	0	3.033	3	1	58.8	101	25	0	91.125	91	7	30	1.826	1.772	1.717	10.896	1252.595	POND 4
	388	34	0	349.506	349	30	21.6	101	25	0	91.125	91	7	30	1.66	1.58	1.5	15.994	1252.687	POND 5
	353	69	50	318.326	318	19	31.8	101	25	0	91.125	91	7	30	1.658	1.54	1.422	23.591	1252.578	FENCE
	348	24	50	313.421	313	25	13.8	101	25	0	91.125	91	7	30	1.685	1.591	1.497	18.793	1252.621	GATE 1
	347	13	50	312.422	312	25	17.4	101	25	0	91.125	91	7	30	1.615	1.526	1.438	17.693	1252.708	GATE2
	322	14	50	289.931	289	55	49.8	103	2	0	92.718	92	43	4.8	1.915	1.866	1.819	9.578	1252.260	FENCE
	296	36	0	266.724	266	43	26.4	103	2	0	92.718	92	43	4.8	2.706	2.667	2.629	7.683	1251.549	FENCE
	300	1	50	270.014	270	0	48.6	103	2	0	92.718	92	43	4.8	1.49	1.472	1.458	3.193	1252.957	GP
	299	55	50	269.600	269	35	58.2	106	3	0	95.427	95	25	37.2	1.93	1.9	1.87	5.946	1252.116	GP
	219	61	0	197.649	197	38	56.4	106	3	0	95.427	95	25	37.2	1.48	1.467	1.458	2.180	1252.907	GP
	219	48	0	197.532	197	31	55.2	111	50	50	100.355	100	21	16.2	1.717	1.697	1.675	4.064	1252.141	GP
	182	6	0	163.854	163	51	14.4	111	50	50	100.355	100	21	16.2	0.63	0.599	0.566	6.193	1252.850	GP
	182	35	50	164.120	164	7	10.2	111	50	50	100.355	100	21	16.2	1.423	1.38	1.337	8.322	1251.680	GP
	171	66	0	154.494	154	29	38.4	106	38	0	95.742	95	44	31.2	0.664	0.628	0.582	8.118	1253.137	GP
	175	95	50	158.360	158	21	34.2	106	38	0	95.742	95	44	31.2	1.21	1.15	1.09	11.880	1252.236	GP

Table 24:Tacheometric Sheet CP2

Table 25:Road Angle Sheet

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey Camp, 2022

Observer: Group 9
Recorder: Group 9
Instrument: Theodolite

Date: 24-Aug-22
Weather: Cloudy,
Temperature: Rain

Horizontal Angle Observation Sheet (Road Surveying) 23°C

Inst. St. and HI	Object	Face	I-Set					Horizontal Angle	Remarks
			D	M	S	M	S		
IP1	IP0	L	0	0	0			81° 41' 33"	
		R	180	0	23	0	11.5		
	IP2	L	81	42	4				
		R	261	41	25	41	44.5		
IP2	IP1	L	0	0	0			73° 43' 53.5"	
		R	179	58	54	59	27		
	IP3	L	73	43	45				
		R	253	42	56	43	20.5		
IP3	IP2	L	0	0	0			148° 40' 12.5"	
		R	180	1	21	0	40.5		
	IP4	L	148	40	51				
		R	328	40	55	40	53		
IP4	IP3	L	0	0	0			170° 58' 7.5"	
		R	179	59	42	59	51		
	IP5	L	170	57	15				
		R	350	58	42	57	58.5		
IP5	IP4	L	0	0	0			101° 31' 39.5"	
		R	179	59	11	59	35.5		
	IP6	L	101	29	26				
		R	281	33	4	31	15		
IP6	IP5	L	0	0	0			116° 26' 34"	
		R	180	0	0	0	0		
	IP7	L	116	27	4				
		R	296	26	4	26	34		
IP7	IP6	L	0	0	0			167° 6' 12"	
		R	179	59	32	59	46		

	IP8	L	167	6	6				
		R	347	5	50	5	58		
IP8	IP7	L	0	0	0			168º 2' 17"	
		R	179	59	18	59	39		
	IP9	L	168	2	18				
		R	348	1	34	1	56		
IP9	IP8	L	0	0	0			179º 10' 5"	
		R	180	0	21	0	10.5		
	IP10	L	179	10	59				
		R	359	9	32	10	15.5		
IP10	IP9	L	0	0	0			171º 51' 24"	
		R	179	59	30	59	15		
	IP11	L	171	51	50				
		R	351	50	28	51	9		
IP11	IP10	L	0	0	0			108º 12' 39"	
		R	179	59	40	59	20		
	IP12	L	108	13	4				
		R	288	11	54	12	29		

Table 26:Road Alignment Sheet

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey Camp, 2022

Observer:Group 9
Date: 22-Aug-22
Recorder:Group 9
Weather: Cloudy, Rain
Instrument: Temperature: 23ºC

Road Alignment Sheet

Intersection point IP`	Distance Between IP's	Changing o IP	Deflection angle,D(□)LR	Radius of Curve R	Tangent Length, TL=Rtan(D/2)	Length of curve LC= 3.142*R*D/180	Apex Distance, E= R*(1/Cos(D/2)-1)	Ch. Of beginning. Of curve,BC= Ch. Of IP-TL	Ch.Of mid of Curve,MC=Ch.of BC+LC/2	Ch.Of End 0f Curve, EC=Ch. Of MC+LC/2	Remarks
IP1	51.976	0+051.976	98º 18' 27"	18	20.819	30.884	9.522	0+031.157	0+046.599	0+062.041	
IP2	85.619	0+126.841	106º 16 6.5"	15	20.003	27.821	10.002	0+106.838	0+120.478	0+134.659	
IP3	48.934	0+163.590	31º 19 47.5"	90	25.238	49.213	3.472	0+138.352	0+162.958	0+187.565	
IP4	58.54	0+220.867	9º 1' 52.5"	200	15.795	31.525	0.623	0+205.072	0+220.834	0+236.597	
IP5	68.495	0+289.297	78º 28 20.5"	15	12.249	20.544	4.366	0+277.048	0+287.320	0+297.592	
IP6	37.394	0+322.737	63º 33' 26"	30	18.585	33.278	5.29	0+304.152	0+320.791	0+337.430	
IP7	97.999	0+416.844	12º 53' 48"	300	33.906	67.526	1.91	0+382.938	0+416.701	0+450.464	
IP8	60.14	0+476.698	11º 57' 43"	200	20.954	41.755	1.094	0+455.744	0+476.622	0+497.499	
IP9	103.1	0+579.645	0º 49' 55"	4000	29.04	58.08	0.105	0+550.605	0+579.645	0+608.685	
IP10	96.12	0+675.765	8º 8' 36"	800	56.947	113.702	2.024	0+618.818	0+675.669	0+732.520	
IP11	112.697	0+788.270	71º 47' 21"	25	18.093	31.324	5.86	0+770.177	0+785.839	0+801.501	
IP12		0+816.398									

Table 27: Cross levelling and Profile levelling sheet

KATHMANDU UNIVERSITY Department of Civil Engineering Survey camp, 2022										
Observer:	Group 9								Date:	24-Aug-22
Recorder:	Group 9								Weather:	Sunny
Instrument:	Auto level								Temperature:	29°C
Profile Levelling Sheet										
Station	Distance,m			B.S	I.S	F.S	H.I	Rise/Fall	R.L,m	Remarks
	Left	Center	Right							
				0.647					1270.000	
S1		0.000			1.113			-0.466	1269.534	IP0
	2.000				1.106			0.007	1269.541	
	4.000				1.298			-0.192	1269.349	
	5.000				1.604			-0.306	1269.043	
	8.000				1.810			-0.206	1268.837	
	9.000				1.813			-0.003	1268.834	
	10.000			1.944		1.813		0.000	1268.834	
			10.000		1.284			0.660	1269.494	
			8.000		1.313			-0.029	1269.465	
			6.000		1.301			0.012	1269.477	
			4.000		1.392			-0.091	1269.386	
			2.000	1.331		1.318		0.074	1269.460	
	10.000				2.136			-0.805	1268.655	
	8.000				2.092			0.044	1268.699	
	6.000				2.093			-0.001	1268.698	

	4.000				2.050			0.043	1268.741	
	2.390				2.008			0.042	1268.783	
	2.000				1.545			0.463	1269.246	
			10.000		0.920			0.625	1269.871	
			8.000		0.933			-0.013	1269.858	
			7.220		0.821			0.112	1269.970	
			6.600		1.217			-0.396	1269.574	
			6.000		1.286			-0.069	1269.505	
			4.000		1.233			0.053	1269.558	
			2.000		1.235			-0.002	1269.556	
S2		20.000		1.093		1.409		-0.174	1269.382	
			10.000		1.255			-0.162	1269.220	
			8.000		1.254			0.001	1269.221	
			6.000		1.536			-0.282	1268.939	
			4.000		1.235			0.301	1269.240	
			2.500		1.363			-0.128	1269.112	
			2.000		1.735			-0.372	1268.740	
	10.000				2.375			-0.640	1268.100	
	8.000				2.359			0.016	1268.116	
	6.000				2.340			0.019	1268.135	
	4.000				2.326			0.014	1268.149	
	3.200				2.239			0.087	1268.236	
	2.848				1.803			0.436	1268.672	

	2.000				1.858			-0.055	1268.617	
S3		31.157		1.290		1.761		0.097	1268.714	BC1
			10.000		0.771			0.519	1269.233	
			8.000		0.839			-0.068	1269.165	
			6.700		1.304			-0.465	1268.700	
			6.000		1.302			0.002	1268.702	
			4.000		1.360			-0.058	1268.644	
			2.000		1.349			0.011	1268.655	
			1.300		1.400			-0.051	1268.604	
			0.692		1.782			-0.382	1268.222	
	10.000				1.924			-0.142	1268.080	
	8.000				1.955			-0.031	1268.049	
	6.000				1.956			-0.001	1268.048	
	4.000				1.940			0.016	1268.064	
	2.000				1.898			0.042	1268.106	
S4		46.599			1.849			0.049	1268.155	MC1
			10.000		2.425			-0.576	1267.579	
			6.000		2.415			0.010	1267.589	
			5.400		1.825			0.590	1268.179	
			5.000		2.044			-0.219	1267.960	
			4.000		1.861			0.183	1268.143	
			2.000		1.898			-0.037	1268.106	
	10.000				2.149			-0.251	1267.855	

	8.000				2.104			0.045	1267.900	
	6.000				2.037			0.067	1267.967	
	4.000				1.910			0.127	1268.094	
	2.000				1.892			0.018	1268.112	
S5		62.041		0.404		1.804		0.088	1268.200	EC1
	10.000				2.567			-2.163	1266.037	
	8.450				2.513			0.054	1266.091	
	8.000				2.156			0.357	1266.448	
	7.400				1.743			0.413	1266.861	
	6.000				1.710			0.033	1266.894	
	4.000				1.666			0.044	1266.938	
	2.000				1.697			-0.031	1266.907	
			10.000		2.559			-0.862	1266.045	
			8.650		2.537			0.022	1266.067	
			8.560		2.272			0.265	1266.332	
			8.000		2.020			0.252	1266.584	
			6.000		1.739			0.281	1266.865	
			4.000		1.715			0.024	1266.889	
			2.000		1.714			0.001	1266.890	
S6		82.041		0.732		1.740		-0.026	1266.864	
			9.000		2.006			-1.274	1265.590	
			8.000		2.017			-0.011	1265.579	
			6.308		1.465			0.552	1266.131	

			6.000		1.952			-0.487	1265.644	
			3.200		1.545			0.407	1266.051	
			2.000		1.485			0.060	1266.111	
	6.000				1.617			-0.132	1265.979	
	4.000				1.526			0.091	1266.070	
	2.700				2.042			-0.516	1265.554	
	2.000				1.886			0.156	1265.710	
	1.200				1.499			0.387	1266.097	
		102.041			1.461			0.038	1266.135	
			3.100		2.083			-0.622	1265.513	
			2.000		1.915			0.168	1265.681	
	10.000				0.570			1.345	1267.026	
	8.000				0.584			-0.014	1267.012	
	6.000				0.663			-0.079	1266.933	
	4.000				0.917			-0.254	1266.679	
	2.000				1.301			-0.384	1266.295	
S7		106.838		0.840		1.608		-0.307	1265.988	BC2
			10.000		1.145			-0.305	1265.683	
			8.000		1.248			-0.103	1265.580	
			6.000		1.242			0.006	1265.586	
			4.000		1.298			-0.056	1265.530	
			2.000		1.674			-0.376	1265.154	
	10.000				1.293			0.381	1265.535	

	8.000				1.358			-0.065	1265.470	
	6.000				1.348			0.010	1265.480	
	4.000				1.517			-0.169	1265.311	
	2.000				1.796			-0.279	1265.032	
S8		120.748		1.058		1.713		0.083	1265.115	MC2
			10.000		1.794			-0.736	1264.379	
			9.000		1.495			0.299	1264.678	
			8.000		1.629			-0.134	1264.544	
			6.000		1.593			0.036	1264.580	
			4.000		1.607			-0.014	1264.566	
			2.000		1.620			-0.013	1264.553	
	10.000				1.351			0.269	1264.822	
	8.000				1.741			-0.390	1264.432	
	6.000				1.680			0.061	1264.493	
	4.000				1.658			0.022	1264.515	
	2.000				1.638			0.020	1264.535	
S9		134.569		0.952		1.568		0.070	1264.605	EC2
			10.000		0.997			-0.045	1264.560	
			8.000		1.200			-0.203	1264.357	
			6.000		1.119			0.081	1264.438	
			4.000		1.150			-0.031	1264.407	
			2.000		1.238			-0.088	1264.319	
	10.000				0.886			0.352	1264.671	

	9.000				1.197			-0.311	1264.360	
	8.000				1.318			-0.121	1264.239	
	6.000				1.250			0.068	1264.307	
	4.000				1.209			0.041	1264.348	
	2.000				1.183			0.026	1264.374	
S10		138.352		0.756		1.073		0.110	1264.484	BC3
	10.000				1.967			-1.211	1263.273	
	8.000				1.822			0.145	1263.418	
	6.000				1.684			0.138	1263.556	
	4.000				1.650			0.034	1263.590	
	2.000				1.611			0.039	1263.629	
			10.000		1.734			-0.123	1263.506	
			8.000		1.754			-0.020	1263.486	
			6.000		1.608			0.146	1263.632	
			4.000		1.618			-0.010	1263.622	
			2.000		1.688			-0.070	1263.552	
S11		162.958		0.826		1.509		0.179	1263.731	MC3
	8.000				1.829			-1.003	1262.728	
	6.000				1.687			0.142	1262.870	
	4.000				1.258			0.429	1263.299	
	2.000				1.232			0.026	1263.325	
			10.000		1.943			-0.711	1262.614	
			6.600		1.898			0.045	1262.659	

			6.000		1.689			0.209	1262.868	
			4.000		1.559			0.130	1262.998	
			2.000		1.549			0.010	1263.008	
S12		187.565		0.789		1.431		0.118	1263.126	EC3
	6.000				2.248			-1.459	1261.667	
	4.000				1.836			0.412	1262.079	
	2.000				1.711			0.125	1262.204	
			10.000		1.961			-0.250	1261.954	
			9.500		1.660			0.301	1262.255	
			8.000		1.664			-0.004	1262.251	
			6.000		1.570			0.094	1262.345	
			4.000		1.652			-0.082	1262.263	
			2.000		1.640			0.012	1262.275	
S13		205.072		0.907		1.621		0.019	1262.294	BC4
			10.000		0.554			0.353	1262.647	
			8.700		1.203			-0.649	1261.998	
			8.000		1.584			-0.381	1261.617	
			7.000		2.105			-0.521	1261.096	
			6.000		2.123			-0.018	1261.078	
			4.000		1.691			0.432	1261.510	
			3.000		1.494			0.197	1261.707	
			2.000		1.623			-0.129	1261.578	
	5.000				2.092			-0.469	1261.109	

	4.000				1.444			0.648	1261.757	
	2.000				1.443			0.001	1261.758	
S14		220.834		0.554		1.621		-0.178	1261.580	MC4
			6.000		1.467			-0.913	1260.667	
			5.600		1.802			-0.335	1260.332	
			5.000		2.075			-0.273	1260.059	
			4.600		2.258			-0.183	1259.876	
			4.000		2.184			0.074	1259.950	
			3.700		1.811			0.373	1260.323	
			2.000		1.932			-0.121	1260.202	
	4.000				2.273			-0.341	1259.861	
	3.000				2.116			0.157	1260.018	
	2.000				1.910			0.206	1260.224	
S15		236.597		0.094		1.874		0.036	1260.260	EC4
	10.000				3.904			-3.810	1256.450	
	8.000				3.643			0.261	1256.711	
	6.000				3.443			0.200	1256.911	
	4.000				3.260			0.183	1257.094	
	2.000				3.066			0.194	1257.288	
			5.000		2.574			0.492	1257.780	
			4.000		2.880			-0.306	1257.474	
			2.000		2.943			-0.063	1257.411	
S16		256.597		0.187		3.039		-0.096	1257.315	

	4.000				4.242			-4.055	1253.260	
	3.000				3.591			0.651	1253.911	
	2.000				2.950			0.641	1254.552	
	1.000				2.395			0.555	1255.107	
			3.400		1.653			0.742	1255.849	
			2.900		2.062			-0.409	1255.440	
			2.000		1.897			0.165	1255.605	
S17		277.048		0.954		1.987		-0.090	1255.515	BC5
	4.000				3.196			-2.242	1253.273	
	3.000				2.693			0.503	1253.776	
	2.000				2.188			0.505	1254.281	
	1.000				1.443			0.745	1255.026	
			4.820		0.175			1.268	1256.294	
			4.000		0.500			-0.325	1255.969	
			2.000		0.680			-0.180	1255.789	
S18		287.320		1.583		0.842		-0.162	1255.627	MC5
			3.670		0.305			1.278	1256.905	
			3.000		0.630			-0.325	1256.580	
			2.000		0.950			-0.320	1256.260	
			1.000		1.526			-0.576	1255.684	
	9.000				3.141			-1.615	1254.069	
	8.450				1.617			1.524	1255.593	
	8.000				1.655			-0.038	1255.555	

	6.000				1.673			-0.018	1255.537	
	4.000				1.743			-0.070	1255.467	
	2.000				1.701			0.042	1255.509	
S19		297.592		0.768		1.591		0.110	1255.619	EC5
	10.000				0.984			-0.216	1255.403	
	8.000				1.102			-0.118	1255.285	
	6.000				1.165			-0.063	1255.222	
	4.000				1.241			-0.076	1255.146	
	2.000				1.238			0.003	1255.149	
			5.000		0.400			0.838	1255.987	
			4.000		0.603			-0.203	1255.784	
			2.000		0.719			-0.116	1255.668	
S20		304.152		0.891		0.714		0.005	1255.673	BC6
	10.000				1.888			-0.997	1254.676	
	8.000				2.015			-0.127	1254.549	
	6.000				1.888			0.127	1254.676	
	4.000				1.838			0.050	1254.726	
	2.000				1.820			0.018	1254.744	
			10.000		0.835			0.985	1255.729	
			8.000		0.804			0.031	1255.760	
			6.000		0.740			0.064	1255.824	
			4.000		0.745			-0.005	1255.819	
			2.000		0.604			0.141	1255.960	

S21		320.791		1.178		1.495		-0.891	1255.069	MC6
	10.000				3.577			-2.399	1252.670	
	8.000				2.666			0.911	1253.581	
	7.000				2.387			0.279	1253.860	
	6.000				1.990			0.397	1254.257	
	4.000				1.910			0.080	1254.337	
	2.000				1.675			0.235	1254.572	
			10.000		0.355			1.320	1255.892	
			8.000		0.610			-0.255	1255.637	
			6.000		1.416			-0.806	1254.831	
			4.000		1.481			-0.065	1254.766	
			2.000		1.576			-0.095	1254.671	
S22		337.430		1.218		1.557		0.019	1254.690	EC6
			6.000		0.011			1.207	1255.897	
			5.000		0.564			-0.553	1255.344	
			4.000		1.061			-0.497	1254.847	
			2.000		1.236			-0.175	1254.672	
	10.000				3.408			-2.172	1252.500	
	8.000				2.523			0.885	1253.385	
	6.000				1.675			0.848	1254.233	
	4.000				1.457			0.218	1254.451	
	2.000				1.385			0.072	1254.523	
S23		357.430		1.787		1.302		0.083	1254.606	

			10.000		0.621			1.166	1255.772	
			8.000		0.588			0.033	1255.805	
			6.000		1.321			-0.733	1255.072	
			4.000		1.682			-0.361	1254.711	
			2.000		1.787			-0.105	1254.606	
	5.000				4.661			-2.874	1251.732	
	3.500				4.186			0.475	1252.207	
	2.000				2.666			1.520	1253.727	
	1.000				1.949			0.717	1254.444	
		377.430			1.778			0.171	1254.615	
			10.000		0.694			1.084	1255.699	
			8.000		0.705			-0.011	1255.688	
			6.000		1.539			-0.834	1254.854	
			4.000		1.719			-0.180	1254.674	
			2.000		1.833			-0.114	1254.560	
	5.000				3.555			-1.722	1252.838	
	3.500				2.775			0.780	1253.618	
	2.000				2.638			0.137	1253.755	
	1.000				2.041			0.597	1254.352	
S24		382.938		2.539		1.881		0.160	1254.512	BC7
			7.800		0.427			2.112	1256.624	
			6.000		0.700			-0.273	1256.351	
			4.000		0.730			-0.030	1256.321	

			3.200		0.855			-0.125	1256.196	
			2.000		1.525			-0.670	1255.526	
			1.000		1.820			-0.295	1255.231	
	10.000				2.638			-0.818	1254.413	
	8.000				2.309			0.329	1254.742	
	6.000				2.253			0.056	1254.798	
	4.000				1.935			0.318	1255.116	
	2.000				1.751			0.184	1255.300	
S25		416.701		1.910		1.732		0.019	1255.319	MC7
			2.000		0.448			1.462	1256.781	
			1.000		0.985			-0.537	1256.244	
	10.000				2.793			-1.808	1254.436	
	8.000				2.164			0.629	1255.065	
	7.000				1.701			0.463	1255.528	
	6.000				1.536			0.165	1255.693	
	4.000				1.525			0.011	1255.704	
	2.000				1.500			0.025	1255.729	
S27		450.464		1.772		1.321		0.179	1255.908	EC7
	10.000				3.644			-1.872	1254.036	
	9.000				3.215			0.429	1254.465	
	8.000				2.775			0.440	1254.905	
	7.000				2.288			0.487	1255.392	
	6.000				1.835			0.453	1255.845	

	4.000				1.580			0.255	1256.100	
	2.000				1.568			0.012	1256.112	
			2.600		0.416			1.152	1257.264	
			2.000		0.805			-0.389	1256.875	
			1.000		1.140			-0.335	1256.540	
		455.744			1.296			-0.156	1256.384	BC8
	10.000				3.768			-2.472	1253.912	
	8.000				3.505			0.263	1254.175	
	6.000				2.941			0.564	1254.739	
	5.000				2.564			0.377	1255.116	
	4.000				2.148			0.416	1255.532	
	2.000				1.293			0.855	1256.387	
			4.500		0.369			0.924	1257.311	
			4.000		0.509			-0.140	1257.171	
			3.000		0.758			-0.249	1256.922	
			2.000		0.741			0.017	1256.939	
S28		476.622		1.148		0.804		-0.063	1256.876	MC8
	10.000				4.546			-3.398	1253.478	
	8.000				4.265			0.281	1253.759	
	6.000				4.041			0.224	1253.983	
	4.000				3.663			0.378	1254.361	
	2.000				3.380			0.283	1254.644	
			10.000		1.182			2.198	1256.842	

			8.000		1.633			-0.451	1256.391	
			6.000		1.827			-0.194	1256.197	
			4.000		2.215			-0.388	1255.809	
			2.000		2.640			-0.425	1255.384	
		497.499		2.400		2.983		-0.343	1255.041	EC8
	4.000				0.315			2.085	1257.126	
	2.300				1.007			-0.692	1256.434	
	2.000				1.070			-0.063	1256.371	
			6.000		0.972			0.098	1256.469	
			5.346		0.957			0.015	1256.484	
			4.000		0.762			0.195	1256.679	
			3.000		1.035			-0.273	1256.406	
			2.000		0.894			0.141	1256.547	
		517.499		2.462		1.118		-0.224	1256.323	
	6.000				0.519			1.943	1258.266	
	4.500				1.375			-0.856	1257.410	
	4.000				1.529			-0.154	1257.256	
	2.000				1.587			-0.058	1257.198	
			3.800		0.927			0.660	1257.858	
			3.000		1.353			-0.426	1257.432	
			2.000		1.464			-0.111	1257.321	
			1.000		1.480			-0.016	1257.305	
		537.499			1.553			-0.073	1257.232	

	5.000				0.049			1.504	1258.736	
	4.000				0.426			-0.377	1258.359	
	3.000				0.591			-0.165	1258.194	
	1.000				0.730			-0.139	1258.055	
			2.650		0.554			0.176	1258.231	
			2.000		0.629			-0.075	1258.156	
			1.000		0.619			0.010	1258.166	
S31		550.605		3.531		0.543		0.076	1258.242	bc9
	10.000				0.962			2.569	1260.811	
	8.000				0.989			-0.027	1260.784	
	6.000				0.998			-0.009	1260.775	
	4.000				0.983			0.015	1260.790	
	2.000				0.956			0.027	1260.817	
			5.000		0.104			0.852	1261.669	
			4.000		0.511			-0.407	1261.262	
			2.000		0.813			-0.302	1260.960	
		579.645		2.659		0.846		-0.033	1260.927	mc9
	10.000				1.217			1.442	1262.369	
	8.000				1.343			-0.126	1262.243	
	6.000				1.380			-0.037	1262.206	
	4.000				1.286			0.094	1262.300	
	2.000				1.315			-0.029	1262.271	
			9.250		0.079			1.236	1263.507	

			8.000		0.537			-0.458	1263.049	
			7.000		1.003			-0.466	1262.583	
			5.000		1.307			-0.304	1262.279	
			4.000		1.464			-0.157	1262.122	
			2.000		1.514			-0.050	1262.072	
		608.685			1.359			0.155	1262.227	ec9
	10.000				1.521			-0.162	1262.065	
	8.000				1.425			0.096	1262.161	
	6.000				1.509			-0.084	1262.077	
	4.000				1.404			0.105	1262.182	
	2.000				1.345			0.059	1262.241	
			7.000		0.579			0.766	1263.007	
			6.000		0.970			-0.391	1262.616	
			5.000		1.317			-0.347	1262.269	
			4.000		1.460			-0.143	1262.126	
			2.000		1.513			-0.053	1262.073	
S31		618.818		1.890		1.392		0.121	1262.194	BC10
			7.000		0.011			1.879	1264.073	
			6.000		0.410			-0.399	1263.674	
			5.300		1.195			-0.785	1262.889	
			4.000		1.568			-0.373	1262.516	
			2.000		1.756			-0.188	1262.328	
	10.000				3.248			-1.492	1260.836	

	8.000				2.555			0.693	1261.529	
	6.000				2.263			0.292	1261.821	
	4.000				1.690			0.573	1262.394	
	2.000				1.790			-0.100	1262.294	
S32		675.669		0.053		1.744		0.046	1262.340	MC10
	10.000				3.730			-3.677	1258.663	
	8.000				3.644			0.086	1258.749	
	6.000				3.524			0.120	1258.869	
	4.000				3.494			0.030	1258.899	
	2.000				3.400			0.094	1258.993	
			10.000		1.326			2.074	1261.067	
			8.000		1.499			-0.173	1260.894	
			7.200		1.717			-0.218	1260.676	
			6.600		2.333			-0.616	1260.060	
			6.000		2.451			-0.118	1259.942	
			5.000		3.052			-0.601	1259.341	
			4.000		3.136			-0.084	1259.257	
			2.000		2.981			0.155	1259.412	
S33		732.520		1.675		2.972		0.009	1259.421	EC10
			10.000		1.582			0.093	1259.514	
			8.000		1.959			-0.377	1259.137	
			6.000		2.101			-0.142	1258.995	
			4.000		2.119			-0.018	1258.977	

			2.000		2.102			0.017	1258.994	
	10.000				3.082			-0.980	1258.014	
	9.800				3.465			-0.383	1257.631	
	8.000				3.332			0.133	1257.764	
	6.000				2.820			0.512	1258.276	
	4.000				2.610			0.210	1258.486	
	2.000				2.530			0.080	1258.566	
		752.520			2.334			0.196	1258.762	
	10.000				2.644			-0.310	1258.452	
	8.000				2.473			0.171	1258.623	
	6.000				2.347			0.126	1258.749	
	4.000				2.140			0.207	1258.956	
	2.000				1.988			0.152	1259.108	
			10.000		1.551			0.437	1259.545	
			8.000		1.560			-0.009	1259.536	
			6.000		1.592			-0.032	1259.504	
			4.000		1.667			-0.075	1259.429	
			2.000		1.670			-0.003	1259.426	
S34		770.177		3.157		1.786		-0.116	1259.310	bc11
	10.000				1.088			2.069	1261.379	
	9.000				1.355			-0.267	1261.112	
	8.000				1.251			0.104	1261.216	
	7.000				1.150			0.101	1261.317	

	6.000				1.192			-0.042	1261.275	
	4.000				1.265			-0.073	1261.202	
	2.000				1.376			-0.111	1261.091	
			9.000		2.078			-0.702	1260.389	
			8.000		2.000			0.078	1260.467	
			6.000		1.994			0.006	1260.473	
			4.000		1.855			0.139	1260.612	
			2.000		1.482			0.373	1260.985	
S35		785.839		3.181		1.298		0.184	1261.169	mc11
	4.000				0.299			2.882	1264.051	
	1.500				0.167			0.132	1264.183	
	1.000				0.320			-0.153	1264.030	
			2.000		0.108			0.212	1264.242	
			1.000		0.246			-0.138	1264.104	
		801.501			0.188			0.058	1264.162	ec11
S36				0.180		2.774		-2.586	1261.6	IP11
S37				3.590		1.680		-1.500	1260.1	-
S38				1.403		0.973		2.617	1262.7	IP10
S39				0.304		2.870		-1.467	1261.2	IP9
S40				0.376		2.931		-2.627	1258.6	R
S41				1.815		2.518		-2.142	1256.5	R
S42				0.744		1.204		0.611	1257.1	IP8
S43				0.495		2.155		-1.411	1255.7	IP7

S44				1.239		1.205		-0.710	1254.9	R
S45				1.782		1.056		0.183	1255.1	IP6
S46				1.042		0.378		1.404	1256.5	IP5
S47				2.875		0.323		0.719	1257.3	R
S48				2.133		0.361		2.514	1259.8	R
S49				1.654		0.637		1.496	1261.3	R
S50				2.101		0.987		0.667	1261.9	IP4
S51				1.685		0.690		1.411	1263.3	R
S52				1.866		1.055		0.630	1264.0	IP3
S53				1.587		0.888		0.978	1264.9	R
S54				1.630		0.643		0.944	1265.9	IP2
S55				2.177		0.472		1.158	1267.1	R
S56				1.888		0.689		1.488	1268.5	R
S57				1.724		0.754		1.134	1269.7	IP1
S58				0.873		1.773		-0.049	1269.6	R
S59				1.292		1.277		-0.404	1269.2	IP0
						0.812		0.480	1269.7	BM

Table 28:Bridge Survey (Angle Computation Sheet)

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey Camp, 2022

Observer: Group 9 Date: 26-Aug-22
Recorder: Group 9 Weather: Cloudy, Rain
Instrument: Theodolite Temperature: 23ºC

Bridge Angle Calculation

Inst. St.and HI	Object	Face	I-Set					Horizontal Angle	Remarks
			D	M	S	M	S		
C	A	L	0	0	0			47º 50' 50"	
		R	180	0	37	0	18.5		
	B	L	47	54	3				
		R	227	53	30	53	46.5		
A	B	L	0	0	0			103º 0' 0.5"	
		R	180	0	0	0	0		
	C	L	103	1	30				
		R	283	1	29	0	0.5		
A	D	L	0	0	0			38º 59' 59"	
		R	180	0	3	0	1.5		
	B	L	39	2	32				
		R	219	2	31	0	0.5		
B	A	L	0	0	0			85º 20' 32.5"	
		R	180	0	1	0	0.5		
	D	L	85	20	34				
		R	265	20	32	20	33		
B	C	L	0	0	0			29º 9' 15"	
		R	180	0	3	0	1.5		
	A	L	29	5	38				
		R	209	5	36	5	38		
D	B	L	0	0	0			55º 39' 23.5"	
		R	180	0	18	0	9		
	A	L	55	39	14				
		R	235	39	51	39	32.5		

Table 29:Bridge Levelling Sheet

KATHMANDU UNIVERSITY
Department of Civil Engineering
Survey Camp, 2022

Observer: Group 9 | Date: 26-Aug-22
Recorder: Group 9 | Weather: Cloudy, Rain
Instrument: Theodolite | Temperature: 23ºC

Ordinary Levelling Sheet

Station	B.S	F.S	Rise	Fall	R.L	Remarks
CP	0.151				1287	CP
A	2.141	2.141	0.615		1285.01	A
CP	1.526	1.526	1.375		1285.625	C
CP		0.151		1.99	1287	CP
	Arithmetic check	0	0		0	
B	2.794				1283.118	B
	2.116	0.17	2.624		1285.742	IS
D	0.522	0.523	1.593		1287.335	D
	0.198	2.168		1.646	1285.689	IS
B		2.78		2.57	1283.119	B
	Arithmetic check	0.001	0.001		0.001	