



SBEU2141 SURVEY CAMP 1

Engineering Survey Briefing (Levelling, Traversing & Detail Survey)

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01 COURSE INFORMATION

02 REGULATIONS & GUIDELINES

03 FIELDWORK PRACTICAL

04 DELIVERABLE

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Lecture Objective

General Objective:

1. To understand knowledge on establishing the planimetric and vertical controls.

Specific Objectives:

1. Demonstrate the technique and skill in engineering and detail surveys using the Traverse and Levelling Survey techniques.
2. Organize survey and mapping work using appropriate tools and procedures.
3. Carry out fieldwork at the designated site(s).
4. Data processing and its calculation.
5. Deliver the project in writing and oral presentation.



Introduction

INTRODUCTION

The survey camp is an intensive survey exercise, covering three aspects of survey work, namely:

- 1. Observation and measurement;**
- 2. Calculation;**
- 3. Plotting.**

The survey training to be carried out is divided into three (3) types of surveyors, namely:

- ❑ Leveling – surveying is carried out to determine the height of the control stations to be used as adjustable level reference for detail surveying works.
- ❑ Traversing – the measuring work that is run for signifying the control points for generating topographic map.
- ❑ Detail Survey – survey work carried out to measure the details in the area of the traverse and 20 m outside the traverse line.

SURVEY SITE



GENERAL REGULATIONS

Discipline during training in the work area

- Several rules have been established, and this discipline should be taken seriously by each student.
- When conducting survey exercises, students must behave politely in terms of speech, behavior, and even clothing. Likewise, it is hoped that the students do not disturb the peace in the surrounding area.
- Cleanliness needs to be maintained, in lodging, and around the perimeter of the work area.
- If any of the students are sick, or, feverishly, immediately contact the lecturer on duty.
- Students are **NOT ALLOWED** to leave the work area without the permission of the supervisor/lecturer on duty.

Discipline When carrying out Survey Work

- Students are required to carry out external work at the appointed time.
- Groups who have been able to complete the work earlier than the specified time, should inform the lecturer. Otherwise they will be deemed absent for the day.
- Additional tools can only be taken (if necessary) through laboratory staff only.
- In the course of outdoor work, students are required to wear appropriate clothing. T-shirts without collars are strictly prohibited and wearing slippers/sandals is not allowed. The work jacket that has been prepared must be worn during work.

Discipline on the Use of Survey Tools

- Only Group Leaders are allowed to take the measuring devices.
- The tools taken should be properly recorded into the tool lending form, and need to be tested before being brought to work.
- Measuring devices should be inspected before use. This inspection should be made at the place of intake. If there is any damage to the build of the device, report it immediately to the laboratory staff, or, the lecturer/supervisor.
- Any damage, or, loss hereafter shall be deemed to be caused by the negligence of the students themselves.
- Measuring tools should be used and well maintained, according to the instructions of the lecturers.

Discipline on the Use of Survey Tools

- When to switch from one station to another, or upon completion of external work, the tools should be ensured that there is nothing left behind. Any damage, or, loss is the responsibility of the group using it, and this should be reported by filling out the form provided.
- If, it is found that the damage, or, the loss of the tool is due to the negligence of the student himself, then, the payment for the repair of the tool, or, for the purchase of a new tool, will be borne by the student himself.
- These general rules are made as a guide to the students who follow the Survey Tent later. Each of the rules is expected to receive attention and cooperation from the students.

NOTE : Instructions other than the above will be made from time to time.



FIELD PRACTICAL

Levelling, Traversing & Detail Surveying

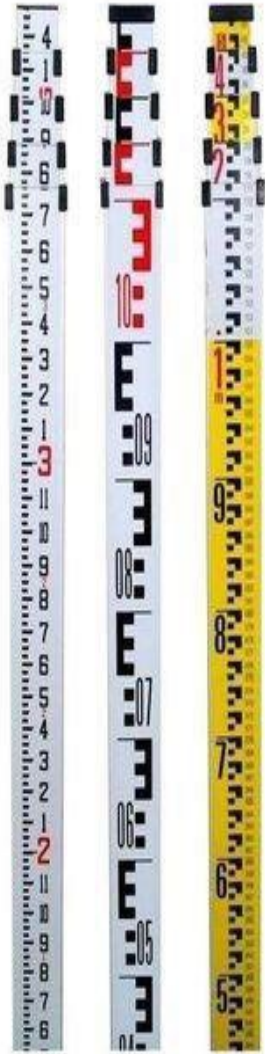
LEVELLING (VERTICAL CONTROL)

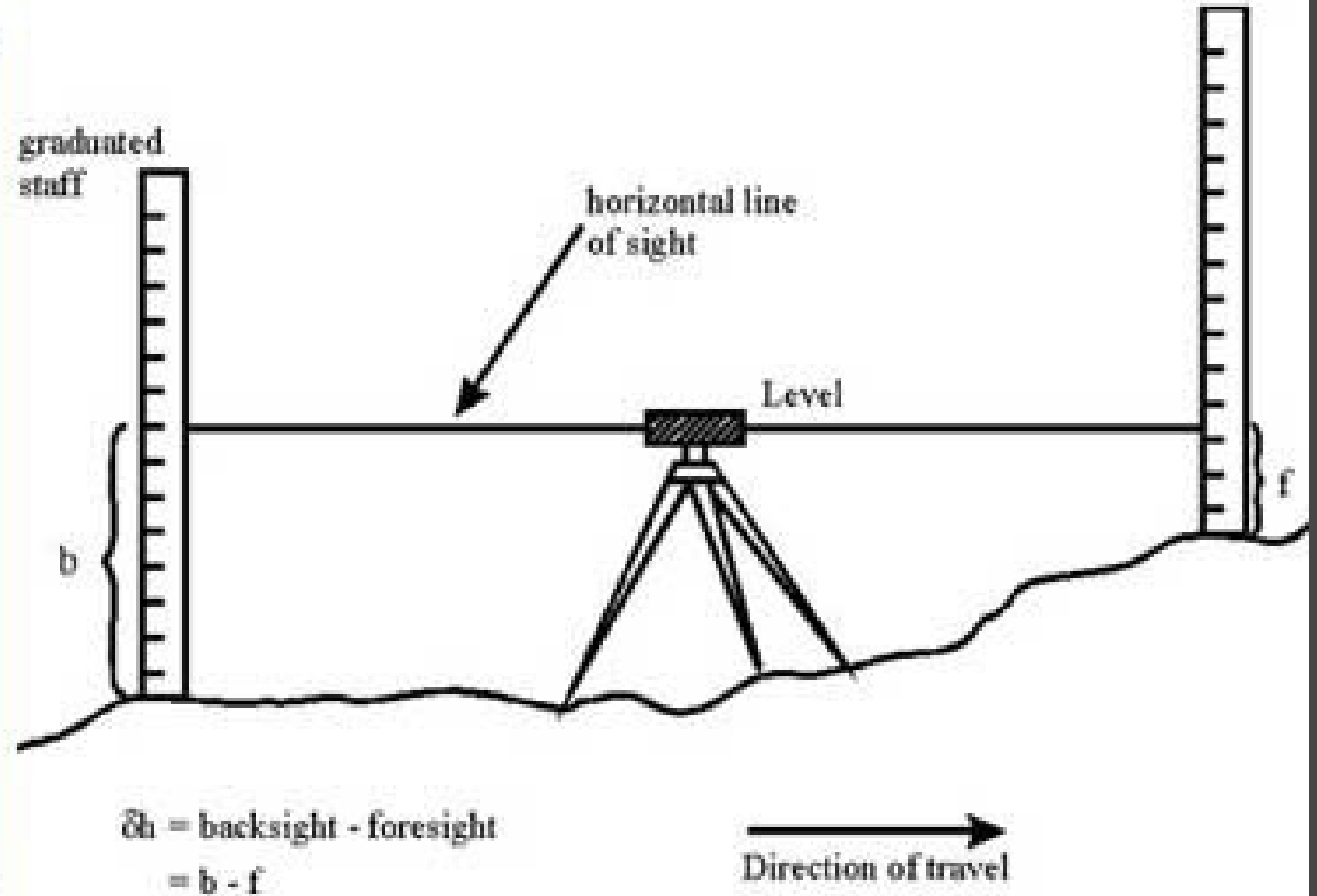
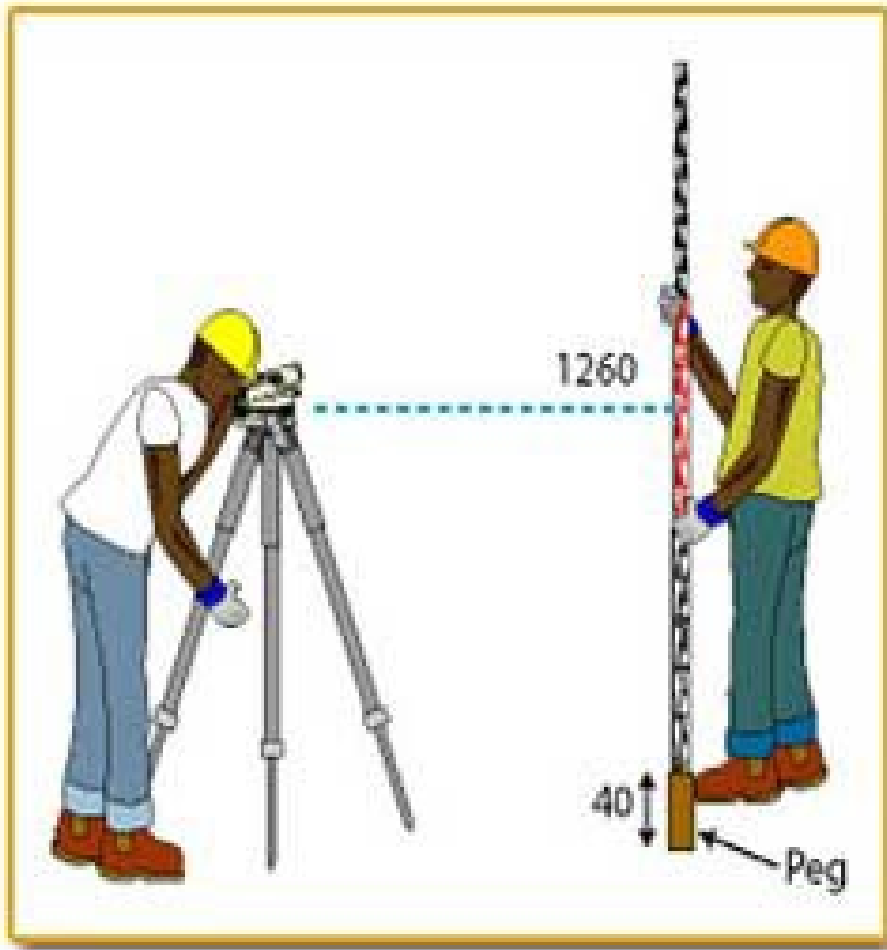


- Levelling is defined as the branch of surveying that is essentially used for determining the relative height of the different points on, above and below the surface of the ground.
- A levelling survey is carried out to determine the height of the control stations to be used as an adjustable level reference for detail surveying works/ topographic surveying.



Levelling Instruments

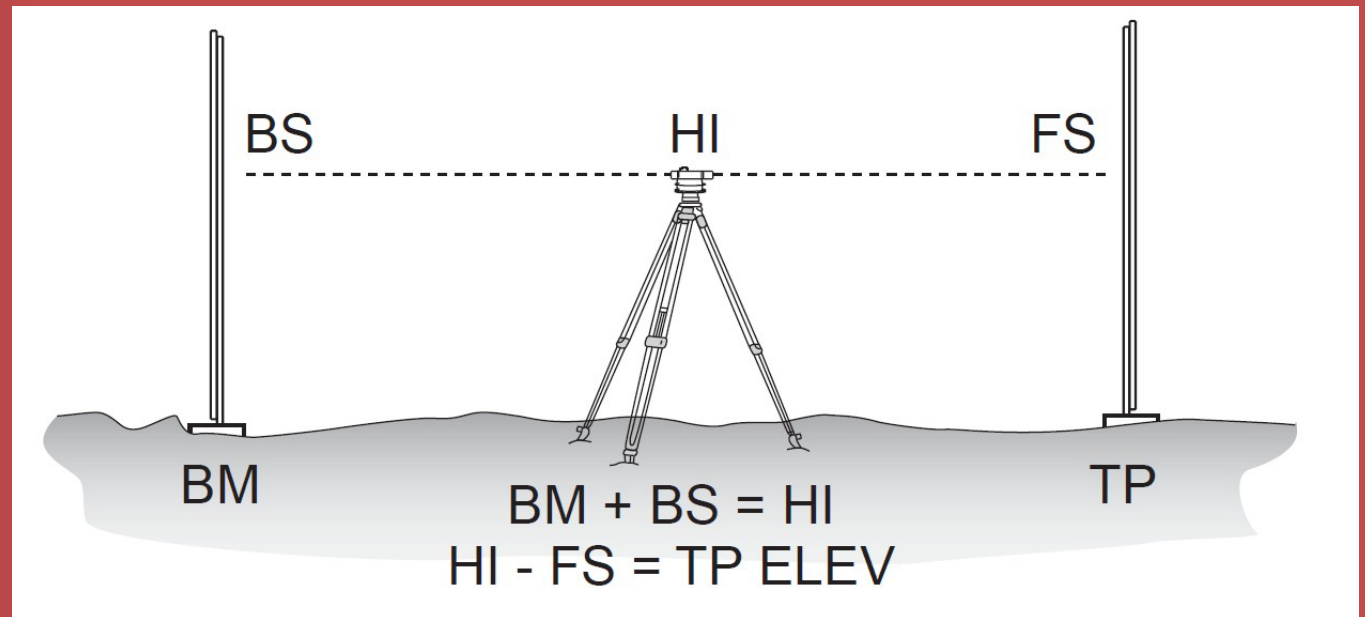
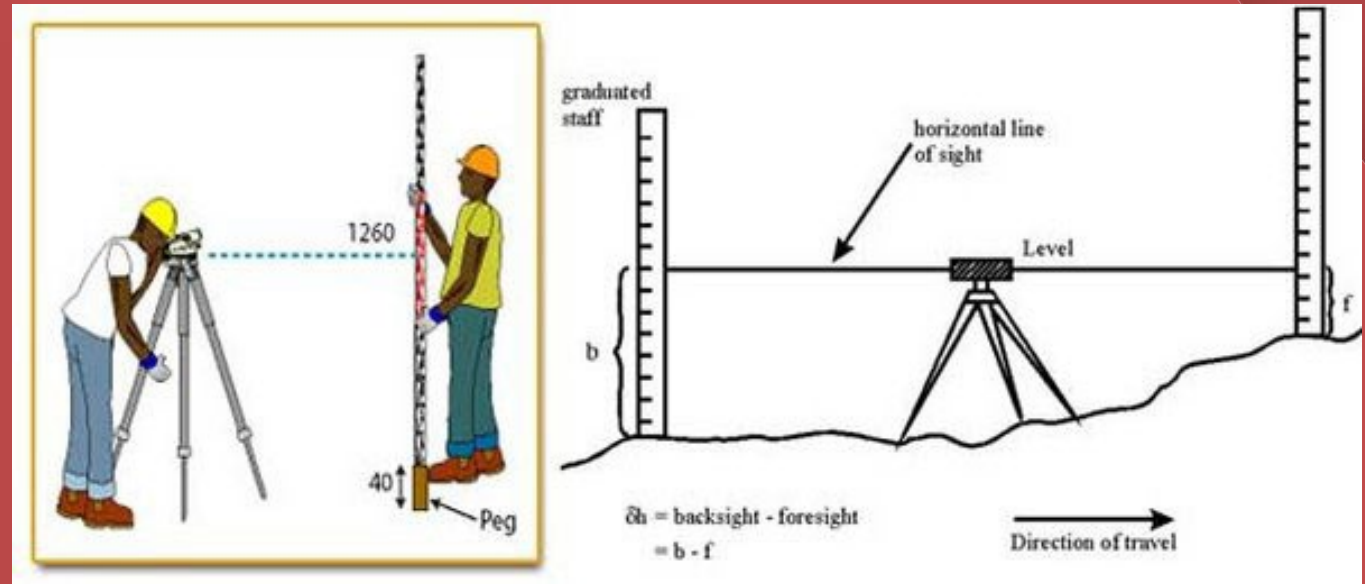




Principle of Levelling

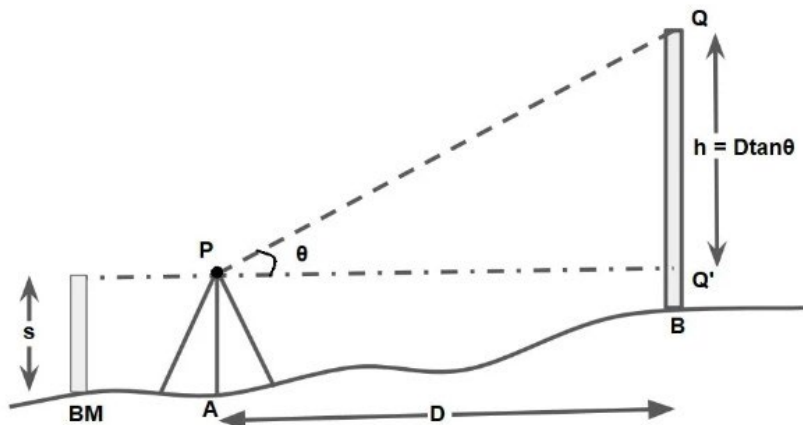
Direct Measurement of Height

➤ Rise & Fall / Height of Collimation



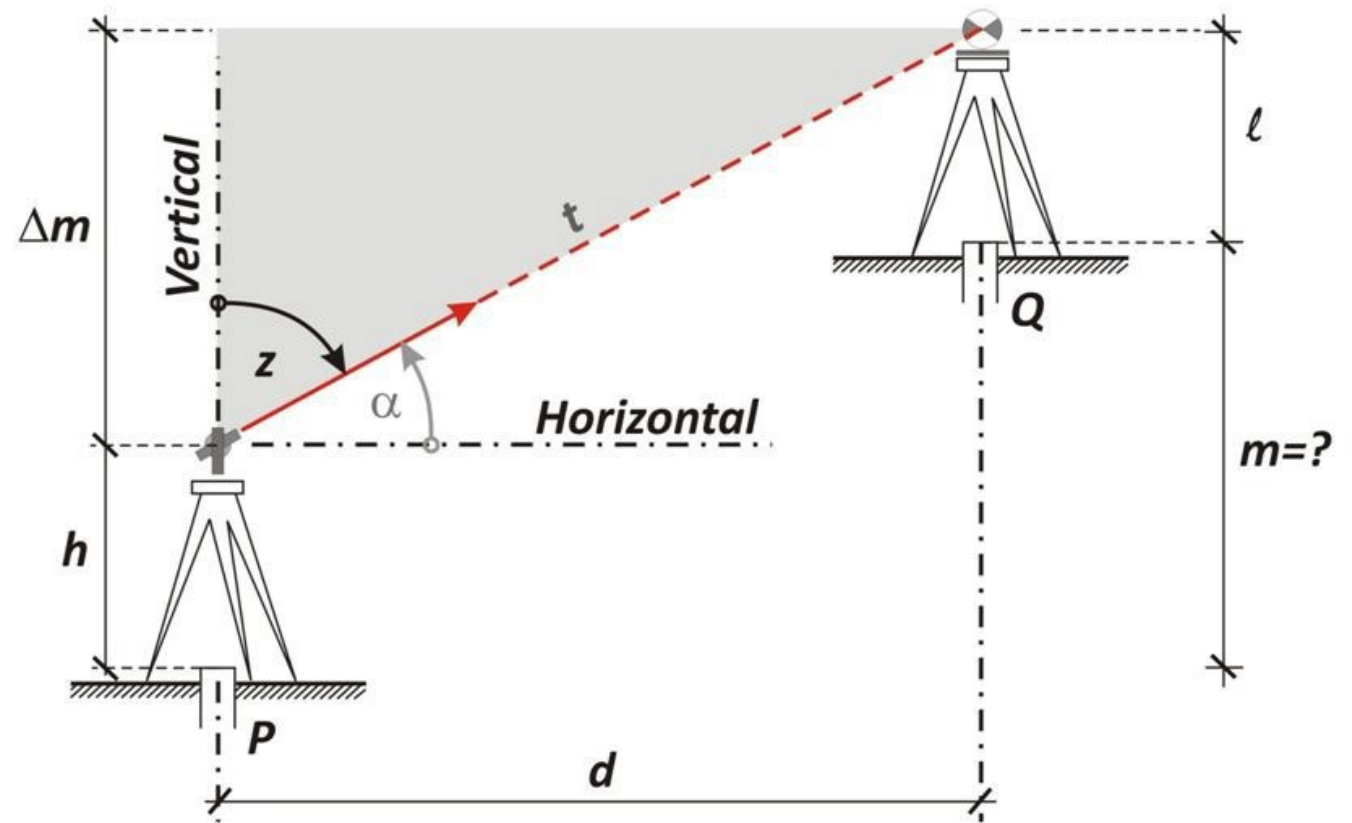
Indirect Measurement of Height

➤ Trigonometric Heighting



R.L of the top of the structure Q = R.L. of B.M + s + $D \tan \theta$.

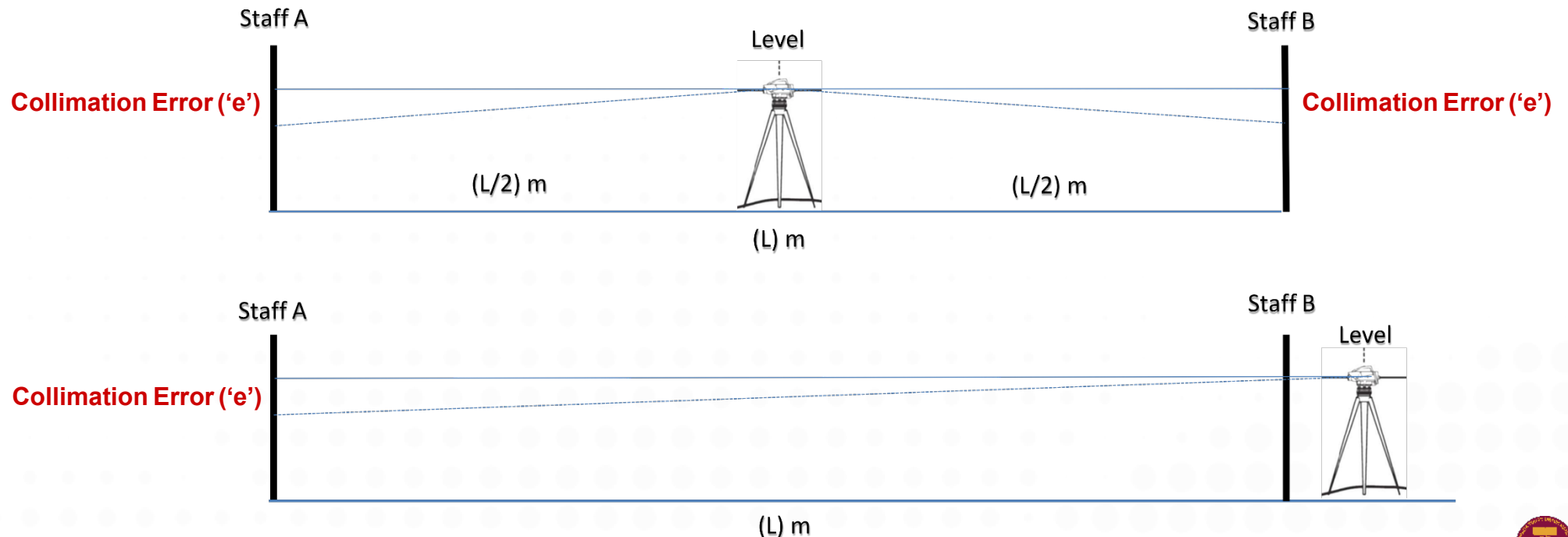
The principle of trigonometric heighting



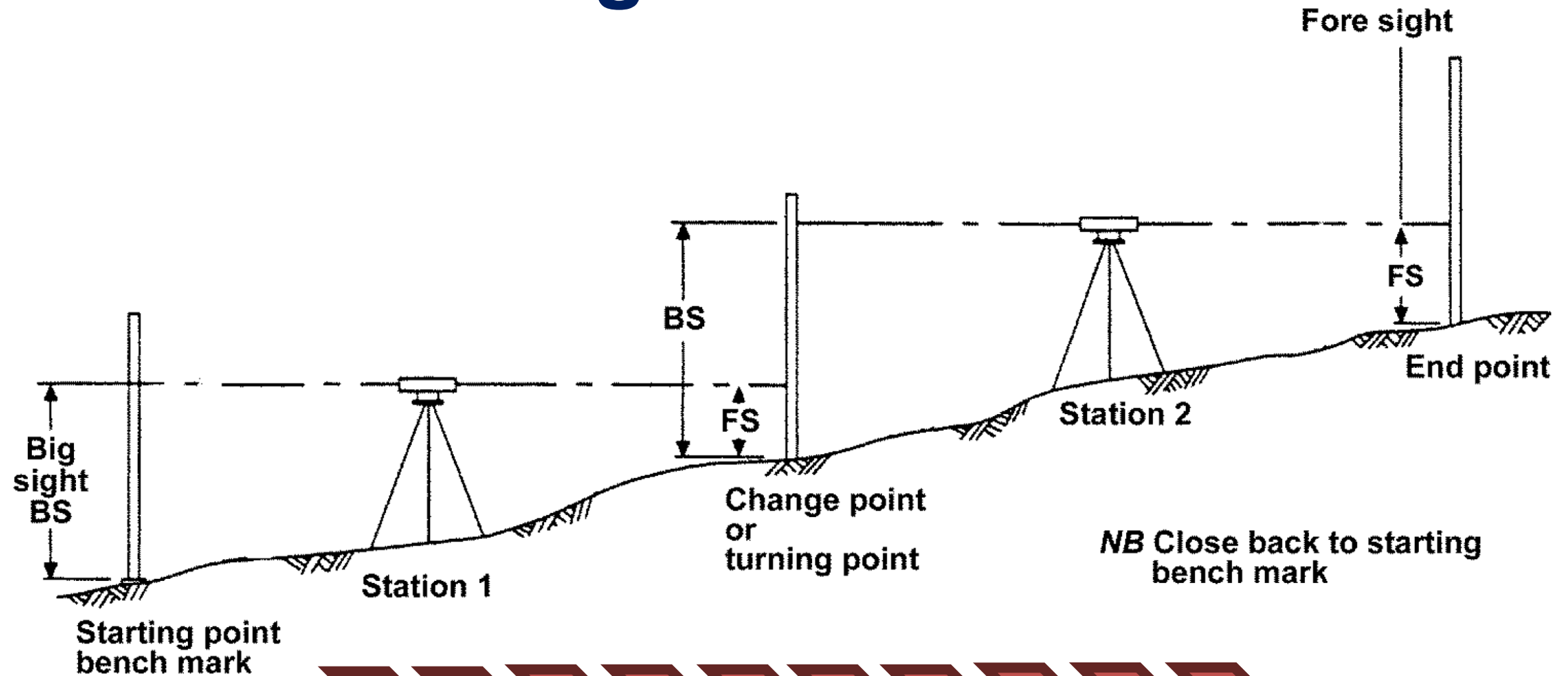
$$m = h + \Delta m - l = h - l + d \cot z$$

TWO PEG TEST

Permanent Adjustment is an adjustment that only needs to be made when it is found that the situation on the tool build is no longer correct. This can be determined by performing a test on the level tool, before it is used. This test is referred to as the Two Peg Test, and the purpose is to determine whether the position of the collimation line is exactly the horizon after the bubble is leveled. The procedure for conducting a two-picket test is as follows:



The Levelling Process BM–TBM



Levelling/ Height Measurement

➤ **Misclosure** (Allowable Error)

- ❑ To decide whether a line of levels is accepted or is rejected. The normally **accepted maximum misclosure** for 2nd Class levelling is:

One Way : $\pm 0.012m \times \sqrt{\text{Total Distance (km)}}$

Return : $\pm 0.02m \times \sqrt{\text{Total Distance (km)}}$

Return : $\pm 5mm \times \sqrt{\text{Number of Instrument Position (n)}}$

- ❑ New guideline PKPUP7/2021, JUPEM.

<https://www.jupem.gov.my/storage/upload/pekeliling/38bc1-pkpup-7-2021.pdf>



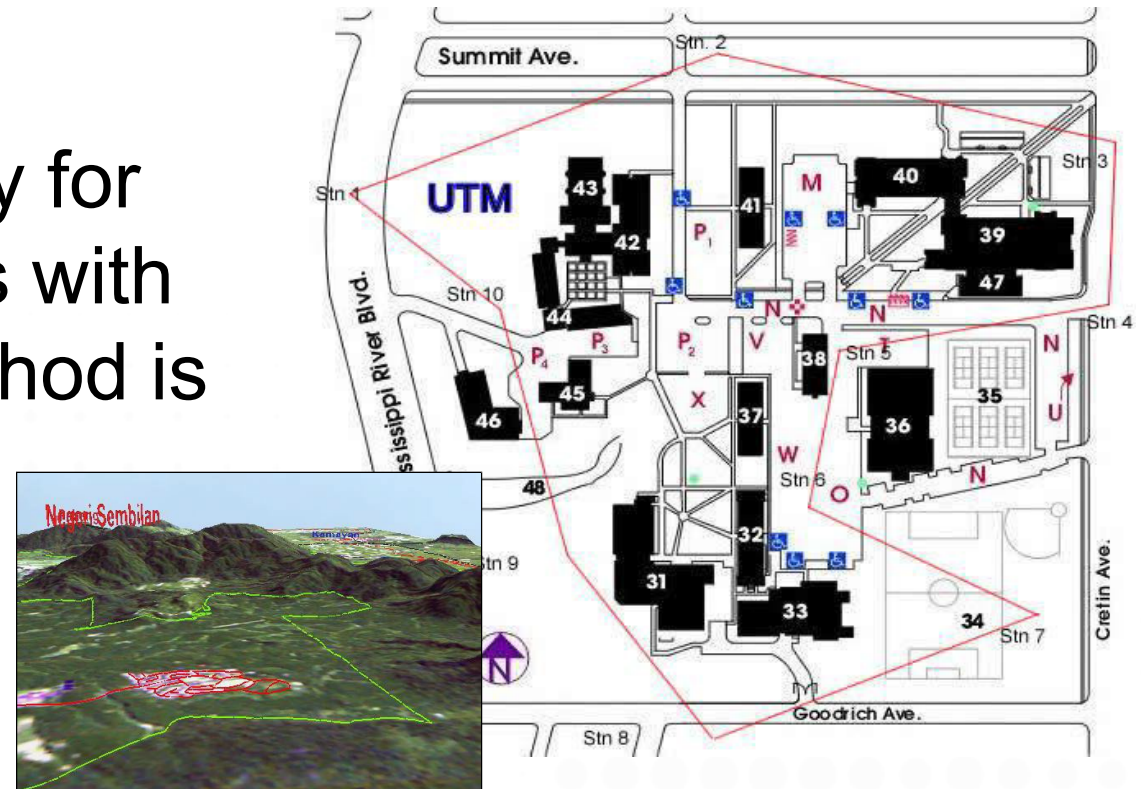
GARIS PANDUAN TEKNIKAL UKUR ARAS (PKPUP 7/2021)



<https://www.jupem.gov.my/storage/upload/pekeliling/38bc1-pkpup-7-2021.pdf>

TRAVERSE (HORIZONTAL CONTROL)

- A traverse survey measures distances and angles (bearing) between the points. These points can serve as control stations.
- Traversing is used usually for smaller areas or on areas with many obstacles. The method is appropriate for land and property surveys as well.



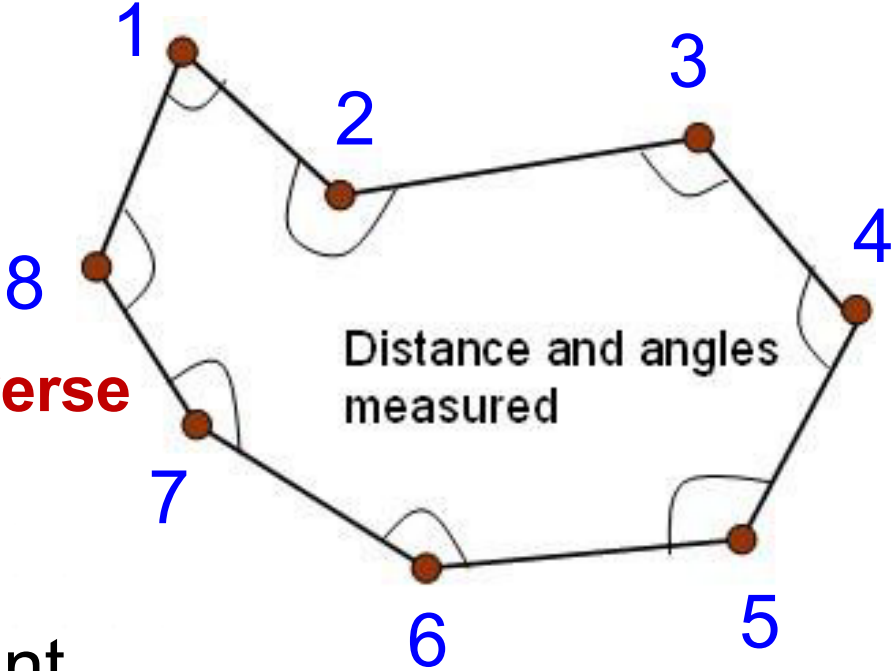
Traverse Instruments



CLOSED TRAVERSE

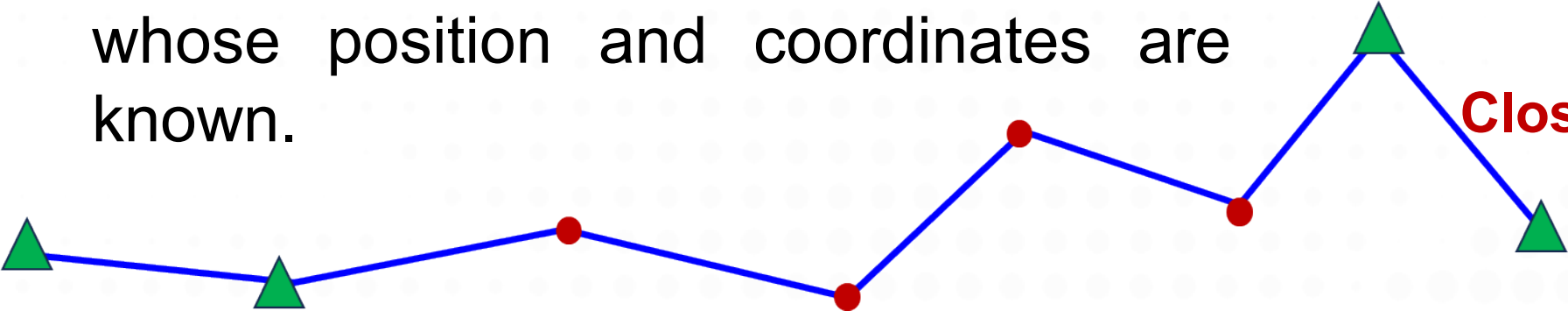
Traverse that start and close at the same point.

Closed Loop Traverse

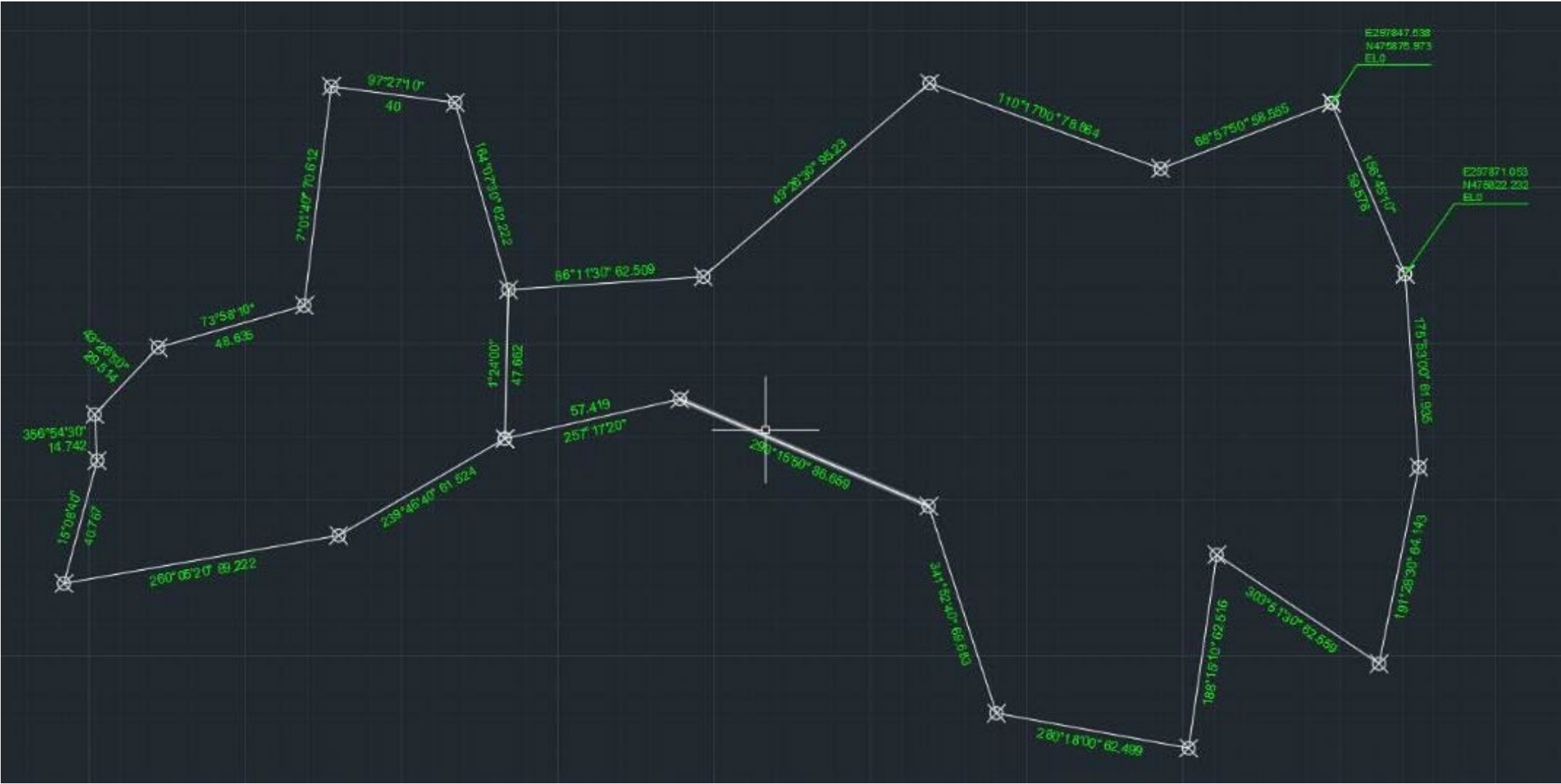


A line that starts and ends at a point whose position and coordinates are known.

Closed Link Traverse



CLOSED TRAVERSE



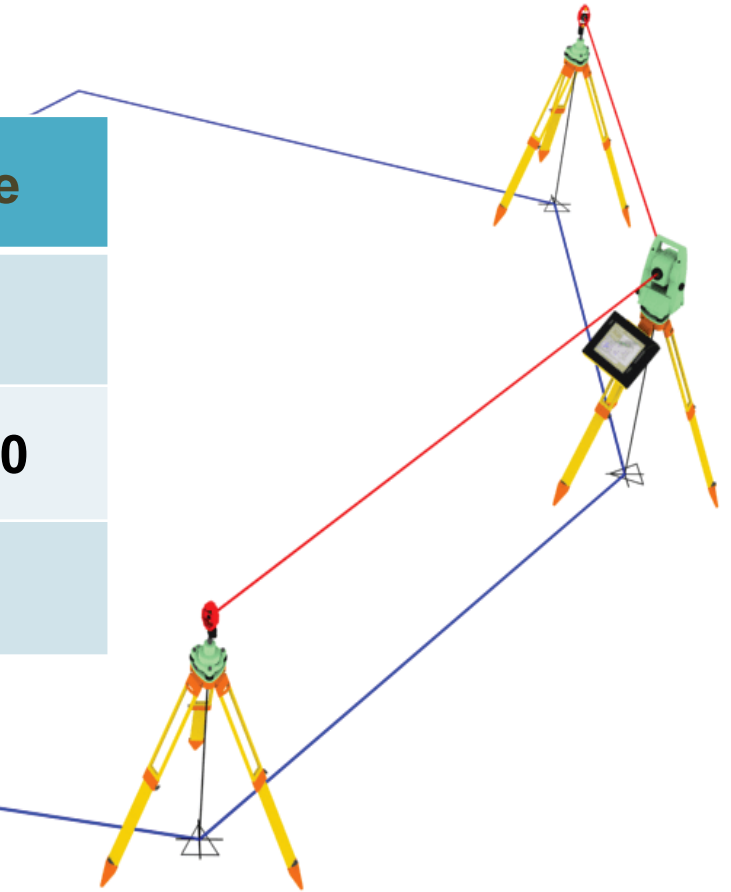
TRAVERSE ADJUSTMENT

Stesen	BEARING/SUDUT			Dari Stn.	GARISAN Bearing Muktamad	Ke Stn.	Sudut pугak (+)	Jarak	Suhu	Jarak Antara	Jarak Muktamad
	Penyilang Kiri	Penyilang Kanan	Purata								
○	<i>Datum Anggaran</i>		182 00 00	2 <i>pkt</i>		1 <i>pkt</i>		47.664	23.07		47.664
1 ○ 2	182 00 00 <i>pkt</i>	01 59 58	86 47 05 <i>M - 00 35 48</i>	2	86 11 20	3	<i>H</i>	62.510 <i>(62.510)</i>			62.51
3	86 47 05	266 47 05	<i>C - 0.14"</i> 86 11 17								
2 ○ 3	266 47 05 <i>pkt</i>	86 47 05	50 02 16 <i>M - 00 35 48</i>	3 <i>pkt</i>	49 26 30	4 <i>pkt</i>	<i>H</i>	95.237 <i>(95.237)</i>			95.237
4	50 02 16	230 02 15	<i>C - 0.28"</i> 49 26 28								
3 ○ 4	230 02 16 <i>pkt</i>	50 02 16	110 52 41 <i>M - 00 35 48</i>	4 <i>pkt</i>	110 16 50	5 <i>pkt</i>	<i>H</i>	78.861 <i>(78.861)</i>			78.861
5	110 52 41	290 52 40	<i>C - 0.42"</i> 110 16 53								
4 ○ 5	290 52 41 <i>pkt</i>	110 52 41	69 33 27 <i>M - 00 35 48</i>	5 <i>pkt</i>	68 57 40	6 <i>pkt</i>	<i>H</i>	58.557 <i>(58.557)</i>			58.557
6	69 33 27	249 33 26	<i>C - 0.56"</i> 68 57 38								
5 ○ 6	249 33 26 <i>pkt</i>	69 33 26	157 20 59 <i>M - 00 35 48</i>	6 <i>pkt</i>	156 45 10 <i>meridian corr.</i>	7 <i>pkt</i>	<i>H</i>	59.573 <i>(59.573)</i>			59.573
7	157 20 59	337 20 58	<i>C - 0.70"</i> 156 45 10								
6 ○ 7	337 20 58 <i>pkt</i>	157 20 58	176 28 58 <i>M - 00 35 48</i>	7 <i>pkt</i>	175 53 10	8 <i>pkt</i>	<i>H</i>	61.928 <i>(61.928)</i>			61.928
8	176 28 58	356 28 57	<i>C - 0.84"</i> 175 53 10								
7 ○ 8	356 28 57 <i>pkt</i>	176 28 57	192 04 30 <i>M - 00 35 48</i>	8 <i>pkt</i>	191 28 40	9 <i>pkt</i>	<i>H</i>	64.136 <i>(64.136)</i>			64.136
9	192 04 30	12 04 29	<i>C - 0.98"</i> 191 28 41								

Stesen	BEARING/SUDUT			Dari Stn.	GARISAN	Ke Stn.	Sudut pugak (+)	Jarak	Suhu	Jarak Antara	Jarak Muktamad
	Penyilang Kiri	Penyilang Kanan	Purata		Bearing Muktamad						
8 9 10	12 04 29 pkt 304 27 51	192 04 29 124 27 53	304 27 52 M - 00 35 48 C - 1.12" 303 52 03	9 pkt	303 52 00	10 pkt	H ✓	62.563 (62.563)			62.563
9 10 11	124 27 52 pkt 188 51 07	304 27 52 08 51 09	188 51 08 M - 00 35 48 C - 1.26" 188 15 19	10 pkt	188 15 20	11 pkt	H ✓	62.509 (62.509)			62.509
10 11 12	08 51 08 pkt 280 54 19	188 51 08 100 54 20	280 54 20 M - 00 35 48 C - 1.40" 280 18 30	11 pkt	280 18 30	12 pkt	H ✓	62.500 (62.500)			62.500
11 12 13	100 54 20 pkt 342 28 50	280 54 20 162 28 51	342 28 51 M - 00 35 48 C - 1.54" 341 53 01	12 pkt	341 53 00	13 pkt	H ✓	69.690 (69.690)			69.690
12 13 14	162 28 51 pkt 293 52 15	342 28 51 113 52 14	293 52 15 M - 00 35 48 C - 1.68" 293 16 25	13 pkt	293 16 30	14 pkt	H ✓	86.662 (86.662)			86.662
13 14 1	113 52 15 pkt 257 53 44	293 52 15 77 53 43	257 53 44 M - 00 35 48 C - 1.82" 257 17 54	14 pkt	257 17 50	1 pkt	H ✓	57.417 (57.417)			57.417
14 1 2	77 53 44 pkt 02 00 04	257 53 44 182 00 00	02 00 02 M - 00 35 48 C - 2" 01 24 12	1 pkt	01 24 10	2 pkt	H ✓	47.663 (47.663)			47.663
	Garisan 1 - 2 dibaca Sepatutnya dibaca Tikaian Pembetulan		02 00 02 02 00 00 + 2" - 0.14"		dalam 14 stn iaitu stn 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14 dan 1 bagi setiap stesen						

Standards for Cadastre Survey

	Angular Misclosure	Linear Misclosure
First Class Survey	$< 1' 15''$	$> 1 : 8000$
2 nd Class Survey	$1' 15''$ to $2' 30''$	$1 : 4000$ to $1 : 8000$
3 rd Class Survey	$> 2' 30''$	$< 1 : 4000$



<https://www.jupem.gov.my/storage/upload/pekeliling/da25f-6.-pek-3-2003.pdf>

Method of Misclosure Adjustment

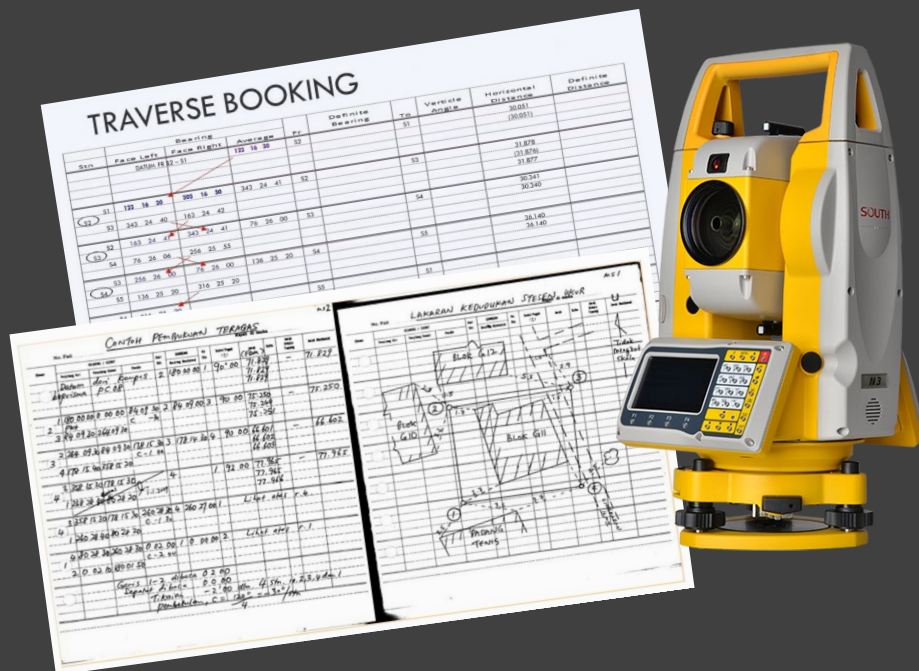
- **Bowditch Adjustment**
- **Transit Adjustment**

❑ **Bowditch Adjustment**

- Based on the distance of a line.

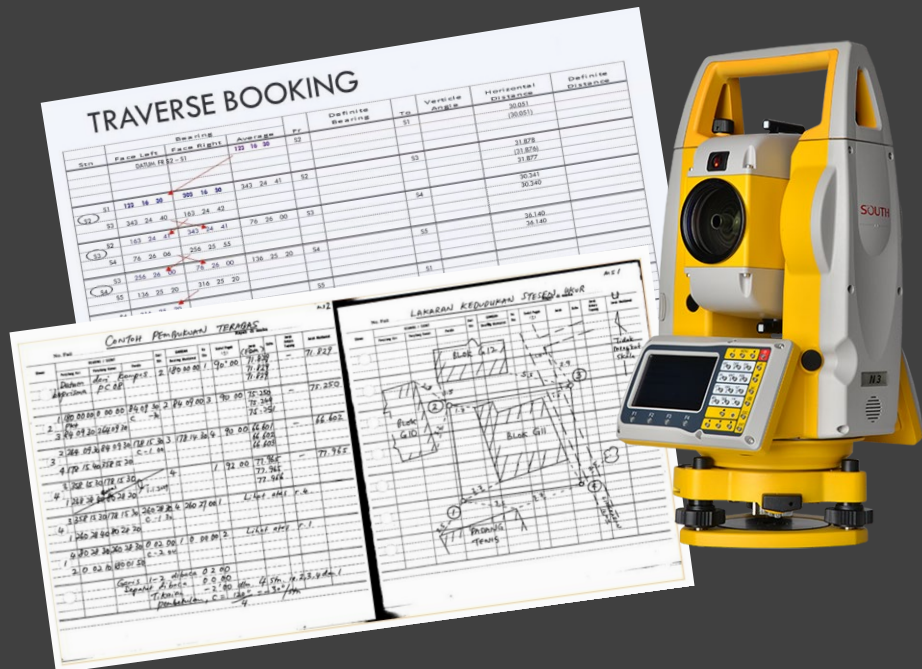
❑ **Transit Adjustment**

- Based on the value of latitude and departure



Method of Misclosure Adjustment

➤ Bowditch Adjustment



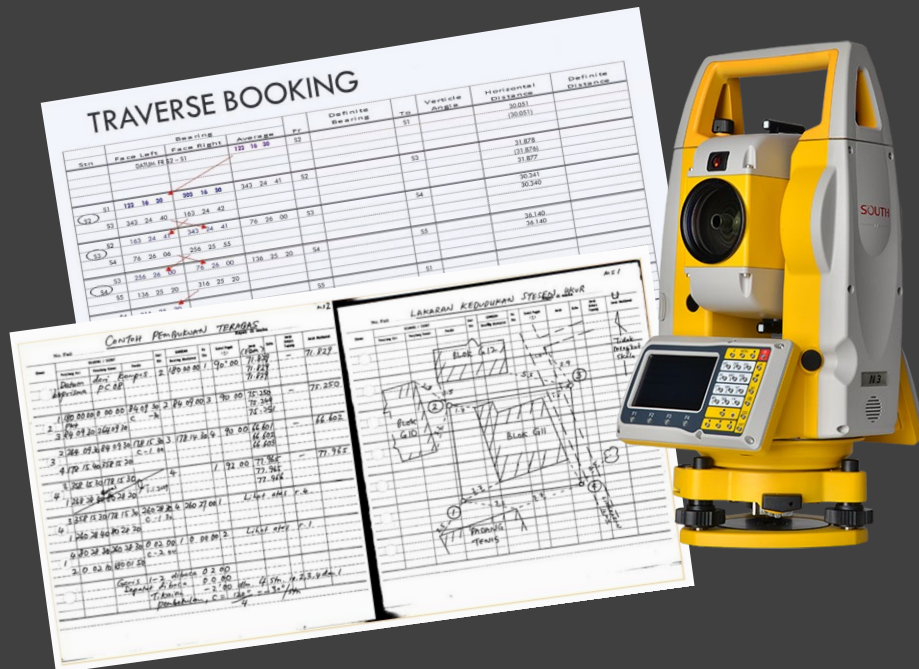
Bowditch Adjustment Formula

$$\text{Latitude adjustment} = \frac{+\Delta L \times \text{Distance of Line}}{\text{Total Distance of Traverse}}$$

$$\text{Departure adjustment} = \frac{+\Delta D \times \text{Distance of Line}}{\text{Total Distance of Traverse}}$$

Method of Misclosure Adjustment

➤ Transit Adjustment



Transit Adjustment Formula

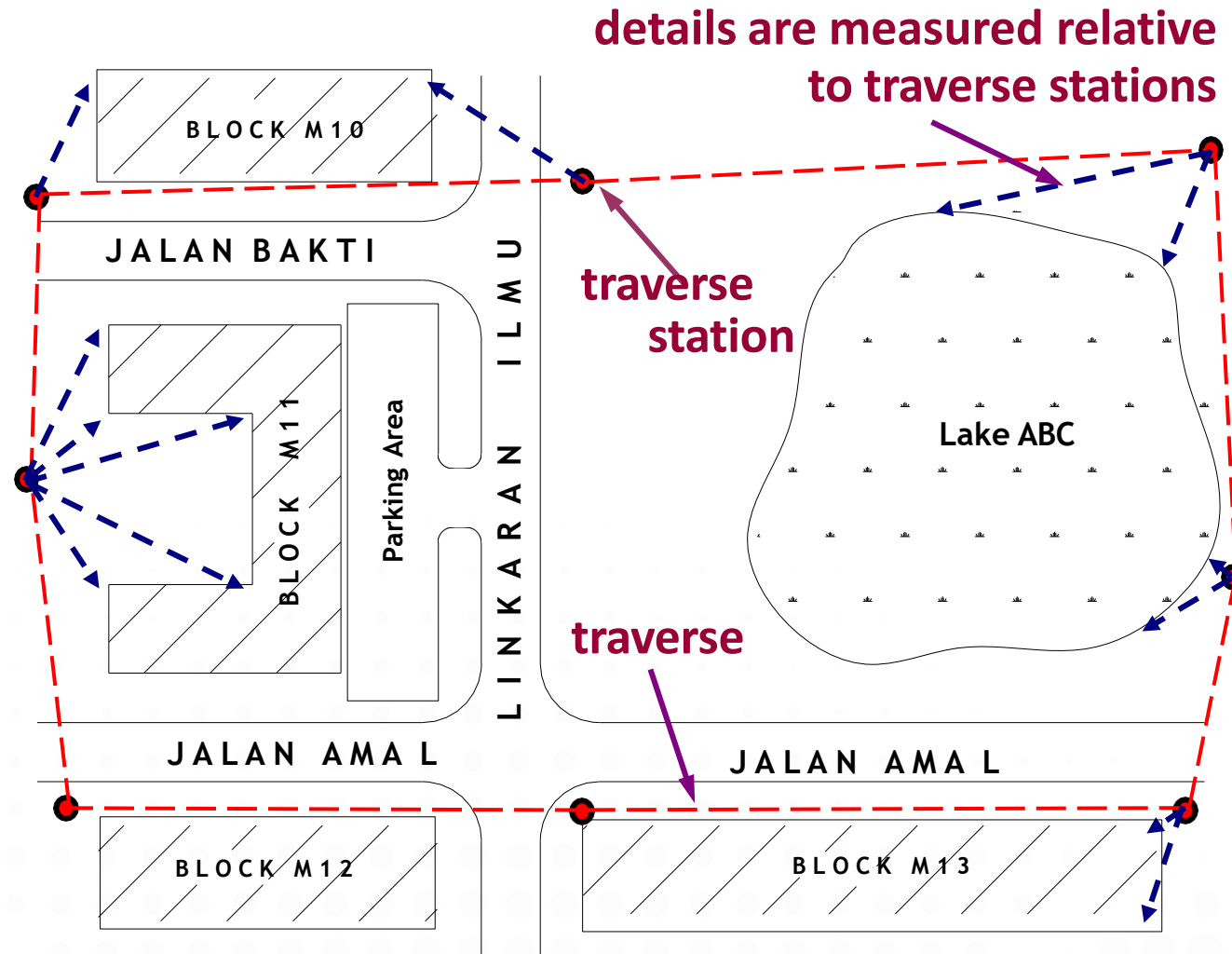
$$\text{Latitude adjustment} = \frac{+\Delta L \times \text{Latitude of Line}}{\text{Total Latitude of Traverse}}$$

$$\text{Departure adjustment} = \frac{+\Delta D \times \text{Departure of Line}}{\text{Total Departure of Traverse}}$$

DETAIL SURVEY

- A detail survey is used to locate and map the major features of a piece of land for planning and construction purposes.
- This includes things such as natural/ man-made structures, vegetation, visible utilities and more.
- Detail surveys also identify the contours of the land and can be used to generate 3D terrain models.

TRAVERSE & DETAIL SURVEY

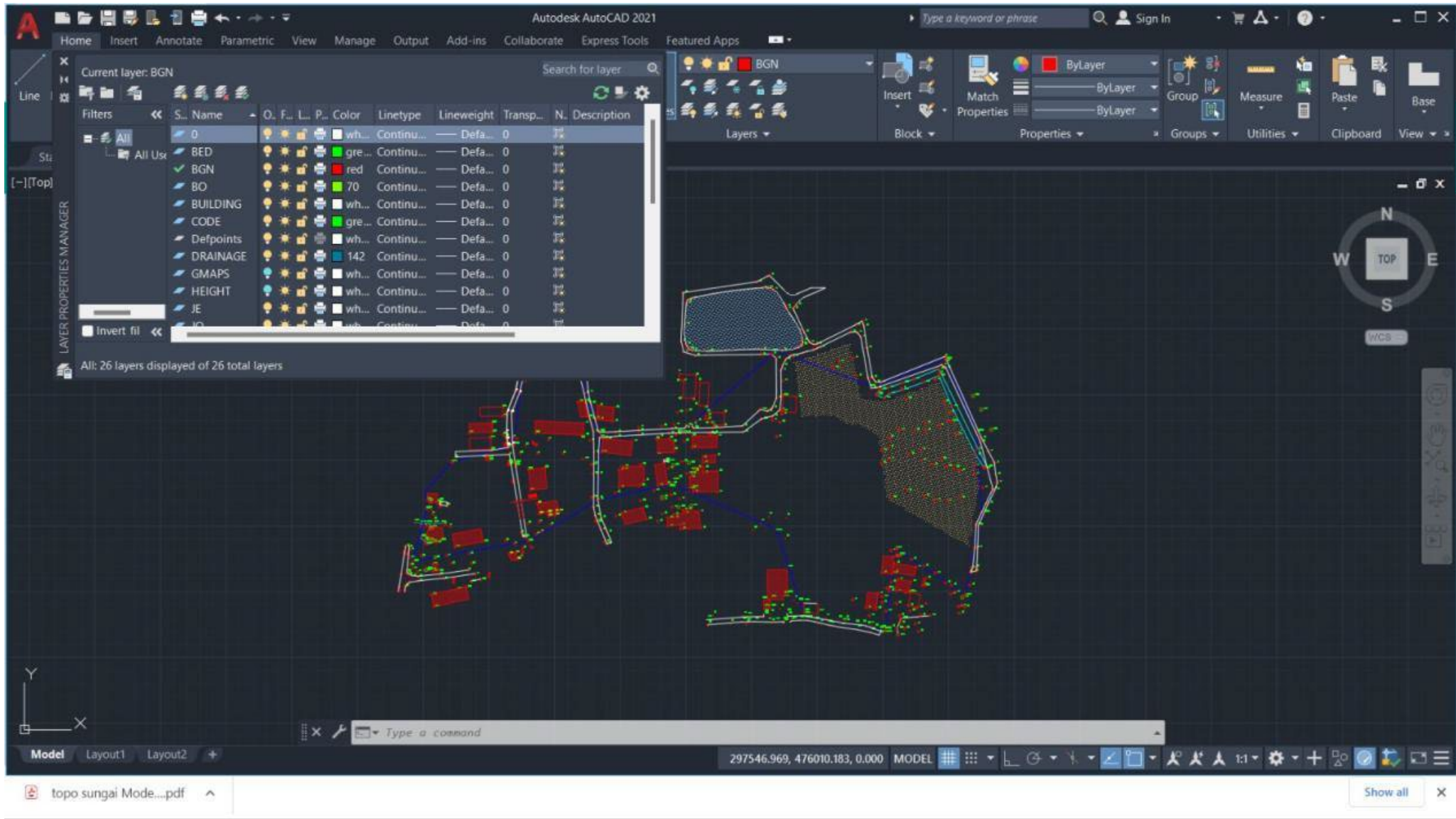


Civil Design and Survey (CDS) Software

Civil Design and Survey (CDS) software is developed by Foresoft Pty Ltd Australia which consists of a suite of powerful design modules that interact seamlessly with the advanced digital terrain modelling and industrial strength CAD engines.

It also gives you advanced design features and functionality to design roads, earthworks, sewer, stormwater and water networks. Together the modules combine to form an integrated design platform for civil engineering infrastructure as well as data gathering, drawing, and surface modelling.







- GENERAL NOTES:**
 1. All dimensions are in meters unless otherwise stated.
 2. The survey was conducted on a clear day.
 3. The survey was conducted using a total station.
 4. The survey was conducted using a level.
 5. The survey was conducted using a theodolite.
- Topographical Features:**
- Contour
 - Building
 - Road
 - Fence
 - Boundary
 - Spot Height
 - Bench Mark
 - Water
 - Stream
 - Drainage
 - Proposed Structure

NO.	REVISION	BY	DATE

PROJECT NAME:

DRAWING TITLE:
TOPOGRAPHICAL SURVEY

DESIGNED BY:
 D. WALKER

DATE:
 06/07/2023

CLIENT:

Crucial Services
 Survey, Land Mapping & CAD
 Horsham College
 Jalan Istana,
 11050 Puteri
 81111 J.A.
 TEL: 0791 89999
 EMAIL: info@crucialservices.net

PROJECT NO:
 MSC-0045

SCALE:
 1:500

DATE:
 06/07/2023

NO.:





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Deliverable (Project Report & Presentation)

Deliverable

PROJECT REPORT's FORMAT

- 1) Introduction
- 2) Objectives
- 3) Scope of works
- 4) Methodology (all tasks)
- 5) Formula Calculation (all tasks)
- 6) Output – Detail topography plan
- 7) Appendices – Booking, diagram and calculation (data logger & manual/conventional)
- 8) Photo/Video + “upload YouTube” (all tasks)
- related to task activities only
- 9) Working file/folder
- 10) Copy data – Google drive/pendrive/DVD



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Assessment (Project Report & Group Presentation)

ASSESSMENT

An assessment will be given to each student based on achievements in three stages of the test, namely:

- **Survey Results** (field book, calculations & plans)
- **Group Presentation**
- **Project Report**



THANK YOU



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