Hashemite University
Faculty of Engineering
Civil Engineering Department

Surveying Laboratory
List of Expirements

1. Setting Out Straight Line/ Horizontal Taping/Pace Length over Sloping Ground
2. Measuring the Sides and the Diagonals of a Quadrilateral
3. Horizontal Control for Mapping by Linear Measurements
4. Testing the Level (Collimation Test)
5. Differential leveling
6. Contouring From Grid (Spot Elevation)
7. Horizontal & Vertical angles using Total station (TS02 PLUS)
8. Total station (TS02 Plus) & Quick-survey
9. Total station-TS02 PLUS programs (Tie distance / Remote height / Area)
10. Total station-TS02 PLUS / (Station setup/ Survey)
11. Total station-TS02 PLUS (Stakeout)
12. Survey Application Using Hi and Prism Height

Survey Engineering Lab

Device Name: level
Used For: establish or verify points in the same horizontal plane. It is used in surveying and building with a vertical staff to measure height differences and to transfer, measure and set heights.
Experiment associated with it: Testing the level and training on leveling
Courses associated with it: surveying

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Machine Identification Card

Name	Manufacturer
LEVEL AUTOMATIC	LEICA /Switzerland
	Model No.
Machine Description	NA730

LEVEL,AUTOMATIC,LIECA ,WITH MANUAL AND CONT AINER.Used For establish or verify points in the same horizontal plane. It is used in surveying and building with a vertical staff to measure height differences and to transfer, measure and set heights.

Safety Instruction	Maintenance Record
Tighten the screws when used	running

The experiment conducted on this machine

Testing the level (collimation test) / Differential leveling

The experiment summary

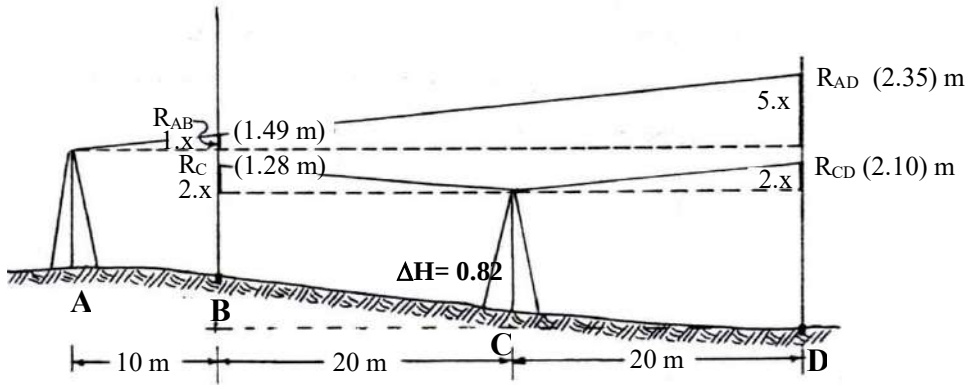
Testing the level.

calculate the misclosure error for a (closed loop leveling) distribute the error.

LEVEL Device Procedure:

Using the naked eye, set out points A, B, C, and D on a straight line, as shown in Fig.3, on an approximately level ground so that AB = 10m, BC = CD = 20 m. Put chaining pins at all the set out points.

- Set the level on point C (halfway between B and D), and take the readings RCB (assume it is = 1.28 m) and RCD (Assume it is = 2.10 m) on the two rods that are held vertically on points B and D.
- Since the instrument is halfway between B and C error in the collimation line will affect both readings (RCB and RCD) in the same way. Therefore, the true difference in elevation ΔH between points B and D is the difference between the readings RCD – RCB (= 0.82 m).



- Move the instrument to point A and level it carefully. Take the readings RAB (assume = 1.49 m) and RAD (assume = 2.35 m) on both rods at points B and D.
- Check the line of collimation by comparing the differences between the two readings taken from station A (2.35 – 1.49 = 0.86 m) and the true difference in elevation between B and D (0.82 m) as calculated in step 3. The line of collimation is out of adjustment if both values differ.

Survey Engineering Lab

Device Name: Digital level
Used For: establish or verify points in the same horizontal plane. It is used in surveying and building with a vertical staff to measure height differences and to transfer, measure and set heights.
Experiment associated with it: Differential leveling/Contouring from grid (or spot) elevations
Courses associated with it: surveying

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Machine Identification Card

Name	Manufacturer
LEVEL DIGITAL	LEICA /Switzerland
	Model No.
Machine Description	SPRINTER 150M

LEICA LEVEL , DIGITAL & ELECTRONIC LEVEL 1.5mm STANDARD DEVIATION HEIGHT MEASUREMENT

Safety Instruction	Maintenance Record
Tighten the screws when used	running

The experiment conducted on this machine

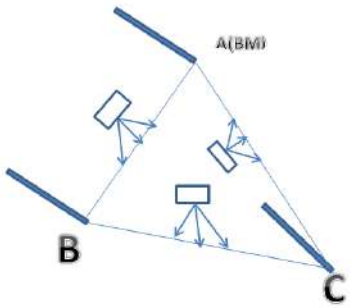
CONTOURING FROM GRID (SPOT ELEVETION)

The experiment summary

draw the contours lines from grid (spot elevation).

Differential leveling Procedure:

- Set the points (a, b, c) on the ground and measure the distance between points.
- Find the elevation of BM using handled GPS.
- Set up the level between A& Bon the middle of distance.
- Sight at A as BS then sight at B as FS
- Set up the level between B& C on the middle of distance.
- Sight at B as BS then sight at C as FS
- Set up the level between C& Aon the middle of distance.
- Sight at C as BS then sight at A as FS



Contouring From Grid Procedure:

Make the grid which has (1m*1m) dimension on the area shown in fig.:4, choose any point around your area and assume it the bench mark which has (600m) elevation.

Read the rod reading for all point from (A1 TO F4) and write it in the table.

Survey Engineering Lab

Device Name: Theodolite
Used For: surveying applications
Experiment associated with it: Measurement of horizontal and vertical angles
Courses associated with it: surveying

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Machine Identification Card

Name	Manufacturer
THEODOLITE	TRIMBLE / SPECTRA - MEXICO
Machine Description	Model No. DET-2

THEODOLITE,ELECTRONIC,CONSIST OF :ELECTRONIC THEODOLITE TYPE TDET-2,PLUG IN BATTERY.Used For: surveying applications

Safety Instruction	Maintenance Record
Tighten the screws when used	running

The experiment conducted on this machine

Horizontal & Vertical angles using Theodolite/Horizontal angles using repetition method & mapping by linear measurements

The experiment summary

Measure Horizontal & Vertical angles using Theodolite

Train to the traversing using linear measurements only

Measure horizontal angle by repetition

Horizontal & Vertical angles Procedure:

Procedure for measuring horizontal angles

- Set the theodolite on point A, center and level the instrument.

  Since the used theodolite is an electronic one, don't initialize the angle and each student should start measurements from a different arbitrary starting angle. Make sure that the readings of the theodolite are reading in an increasing order when the theodolite is rotated from left to right, if not you have to change the polarity of the reading direction.

- Put the telescope in position I (Face Left):

  Sight with the vertical hair bisecting the left target (L) or simply sight on the left target, record the reading "a" in column 3 first raw in Table 1 (276º 14' 23'').

  Sight on the right target (R), record the reading "b" in column 3 second raw (307º 51' 33'').

- Put the telescope in position II (Face Right):

  Sight on the right target, record the reading "c" in column 4 second raw (127º 51 '41'').

  Sight on the left target, record the reading "d" in column 4 first raw (96º 14'34'').

- Record the degrees of position I, and the mean of the minutes and seconds of readings (a) and (d) for the left target in the column headed "Mean" (276° 14' 28").
- Write the degrees of position I and the mean of the minutes and seconds of readings (b) and (c) for the right target in column "Mean" (307° 51' 37").
- Calculate the value of the angle by subtracting the mean reading of the left target from the mean reading of the right target and record the result in the column headed "Angle".

  Angle LÂR = 307° 51' 37" – 276° 14' 13" = 31° 37' 13"

- Add 360° to the mean reading of the right target if it is smaller than the mean reading of the left target as can be seen in the second example in Table 1. Why do you have to add the 360°?

Mean Angle 31° 37’ 11

Angle LÂR = 360° + 9° 19’ 47” – 337° 42’34” = 31° 37’ 13”

- The angle LÂR can be obtained by calculating both half angels from position I and position II as shown in Table 2:
- For any subsequent measurement of the same angle change the initial reading as follows:
    a. For 1” theodolites, rotate the horizontal graduated circle directly using the circle setting knob.
    b. For repetition theodolites, loosen the lower plate, tighten the upper screws, and rotate the alidade a small angle.

Fix the lower plate by tightening the lower screws. Loosen the upper plate and proceed with the measurements without touching the lower screws.

- Calculate the mean of the results of all measurements to find the final value of the angle (31° 37’ 11”).

Procedure for measuring vertical angles

- Sight while the theodolite is in position I (Face Left) with the horizontal hair bisecting the target.
- Center the bubble of the index level (match both ends in case of split bubble levels). This step is not needed in theodolites with automatic vertical collimation.
- Take the reading and record it (87° 22’ 43”) (Table 3).
- Reverse the telescope to position II (Face Right) and repeat steps 1, 2, and 3. Record the reading (272° 39’ 57”).
- Add both readings and compare the results with 360°. The difference (0° 2’ 40”) is twice the value of the index error.
- Correct the readings such that their sum agrees with 360° exactly (87° 21’ 23” + 272° 38’ 37”= 360° 00’ 00”).
- Subtract the corrected angle of position I from 90° to get the vertical angle (90° 00’ 0” - 87° 21’ 23” = + 2° 38’ 37”).

Survey Engineering Lab

Device Name: : Total station
Used For: surveying and building construction
Experiment associated with it: TOTAL STATION(quick survey, programs, survey, stakeout)
Courses associated with it: surveying

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Machine Identification Card

Name	Manufacturer
TOTAL STATION	LEICA /Switzerland
	Model No.
Machine Description	TS02 PLUS

LEICA FLEXLINE TOTAL STATION 500m REFLECTOR LESS.Used For surveying and building construction

Safety Instruction	Maintenance Record
Tighten the screws when used	running

The experiment conducted on this machine

(Q-survey/ Tie distance / Remote height / Area)/ Stakout/ station setup

The experiment summary

Find coordinates and measure distances and area using total station (TS02 plus).

To be familiar with total station.

Leica flexline ts02 plus total Procedure

- Level the TS02 PLUS.
- Setup the total station with known station.
- Choose the program you wants surveying or stake out

Stake out Procedure

- **Level the TS02plus**
- **Turn the laser on from fixed key (FNC button)**
- **PROGRAM→ stakeout**

From function key choose **ENH** (to enter point name and the coordinate of your points)
Slide the horizontal screw until **Hz= 0 00 00** → DIST
Move the telescope according to the distance appear in screen →DIST
Repeat the same procedure until tick mark appear in screen

Survey Engineering Lab

Device Name: GNSS RTK
Used For: survey points or layout it
Experiment associated with it: Surveying using GNSS
Courses associated with it: surveying

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Machine Identification Card

Name	**Manufacturer**
GNSS RTK GPS ROVER	**Trimble - United states**
Machine Description	**Model No.** **SP85**

Gnss rtk gps rover (gnss antenna rover spectra sp85 + data controller al - giz rt8.

Safety Instruction	**Maintenance Record**
Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage	**Running**

The experiments conducted on this machine

Surveying using GNSS

The experiments summary

Determine the form, boundary, and position of objects or points in space relative to other forms, boundaries or points using GNSS.

GNSS ANTENNA ROVER SPECTRA SP85
DATA CONTROLLER AL - GIZ RT8 Procedure:

- Determine the place to be surveyed, and then look at the aerial map to determine the calibration points
- Choose at least three POINTS around the desired place for calibration.
- Monitor the required points or stakeout them.