Exercise: Land Surveying – Spot Elevations

Green Industry Fundamentals

Overall Expectation(s):

A4. use mathematical, documentation, research, and communication skills as they apply to the Green Industries.

Specific Expectation(s):

A4.4 perform metric and imperial unit conversions and other calculations as required for a variety of green industry applications

Green Industry Skills

Overall Expectation(s):

B3. demonstrate competence in technical skills related to specific applications and tasks within the green industries.

Specific Expectation(s):

B3.3 demonstrate competence in related technical skills (land surveying).

Purpose:

To measure and check the height of land and a variety of features around the school property using land surveying equipment. Developing spot elevations leads to providing applications of the data into basic maps or site plans, and can be used for making contour models. Contractors need to know spot elevations when constructing patios, walkways, retaining walls, etc.

Definition of Terms:

Benchmark:	The known elevation of a point (eg: top of fire hydrant).
Established Height:	The height of the survey unit as established by setting up the tripod and level – this height will vary for each group and usually each time.
Height of Instrument:	The height of the middle of the lens measured plumb to the ground PLUS the benchmark elevation. (eg benchmark given as

	100.00 metres a.s.l. (above sea level) + 1.52 metres above ground = 101.52 height of instrument.
Foresight:	The measurement of the ground at a given station point as measured forward from the level.
Backsight:	The measurement of the ground at a given station point as measured backward from the level. Often used to backsight to a benchmark (BM) for calibration.
(Spot) Elevation:	The calculated ground elevation at a station point (at that spot).
Azimuth Angle:	The angle as measured from north.

Getting Started:

In your teams, set up the surveying equipment as follows:

(1) Place the tripod into the ground and using the step assist, ensure the tripod is stable by "stepping" the tripod deeper into the ground.

(2) Loosen the nuts on the tripod legs and extend the unit to a desirable height (eg: 1.5m) then tighten the nuts – try to level the tripod as much as possible.

(3) Remove the main unit from the box and attach the main unit to the flat top of the tripod by matching and tightening the screw.

(4) Using the three thumbscrews in combination and mirror, properly level the main unit so that the air bubble is within the circle – the unit is now level.

DO NOT MOVE THE TRIPOD ONCE IT IS STABLE AND LEVEL.
REVERSE THE ORDER FOR PACKING UP THE KIT.

Survey Strategy:

Your team will need to "shoot" or record a number of station points. These are often determined by the project such as corners, curbs, low points, etc. Refer to the instructor for required station points. These will be calculated as "Spot Elevations" and represent the height of land at that point. Take turns operating the level, recording, and using the measuring rod. Create a sketch that illustrates the site you are working at. This can be used together with your handout sheet to record all of your original data.

(5) Place the level and unit in an unobstructed area, including other groups' location, which will allow your group to complete the required number of station points.

(6) With the lens cap off, foresight the first location and set the azimuth reading dial to 0 degrees. Read and record the rod measure.

(7) Continue sighting and recording each station point. **DO NOT FORGET TO READ THE ANGLE BETWEEN EACH STATION POINT. It is best to start due north and do a "sweep" from 0 degrees (meaning a clockwise direction).**

(8) When disassembling the unit, leave the tripod in the ground, loosen the nuts and let the legs slide down into folded position. Tighten nuts and wrap Velcro strap around legs – carry tripod and measuring rod in "down" position.

SURVEY NOTES WORK SHEET

DATE: _____ WEATHER CONDITIONS: _____

TEAM MEMBERS: _____

HEIGHT OF INSTRUMENT = BENCHMARK 100.00 m (a.s.l.) + ESTABLISHED HEIGHT (H.I)

Example:

HEIGHT OF INSTRUMENT = BENCHMARK 100.00 m (a.s.l.) + ESTABLISHED HEIGHT

101.52 = 100.00 (Given) + 1.52 (Set Up)

Station Point Number	**Label Location**	**Foresight Reading (F.S.)**	**Azimuth Angle**	**New Elevation (H.I. – F.S.)**
EG: Station A	Top of MH – Maintenance Hole	1.63	0 º	99.89 (101.52 – 1.63)
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Note: Teams of 2 should complete at least eight (8) station points per team.

Marks / 8 Communication	Marks / 8 Communication	Marks / 8 Communication	Marks / 8 Knowledge	Marks / 8 Thinking

Additional Marks: 5 marks for sketch (communication), 2 marks for accurately completing top part of work sheet (knowledge), 10 marks for setting up instrument correctly, measuring, and packing up (application).

Communication / 29 Knowledge / 10 Thinking / 8 Application / 10

Total Marks / 57