Geological Mapping and Surveying

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Principles of Surveying

Surveys and Surveyors

Basic principles of surveying:

Reconnaissance, Control points,

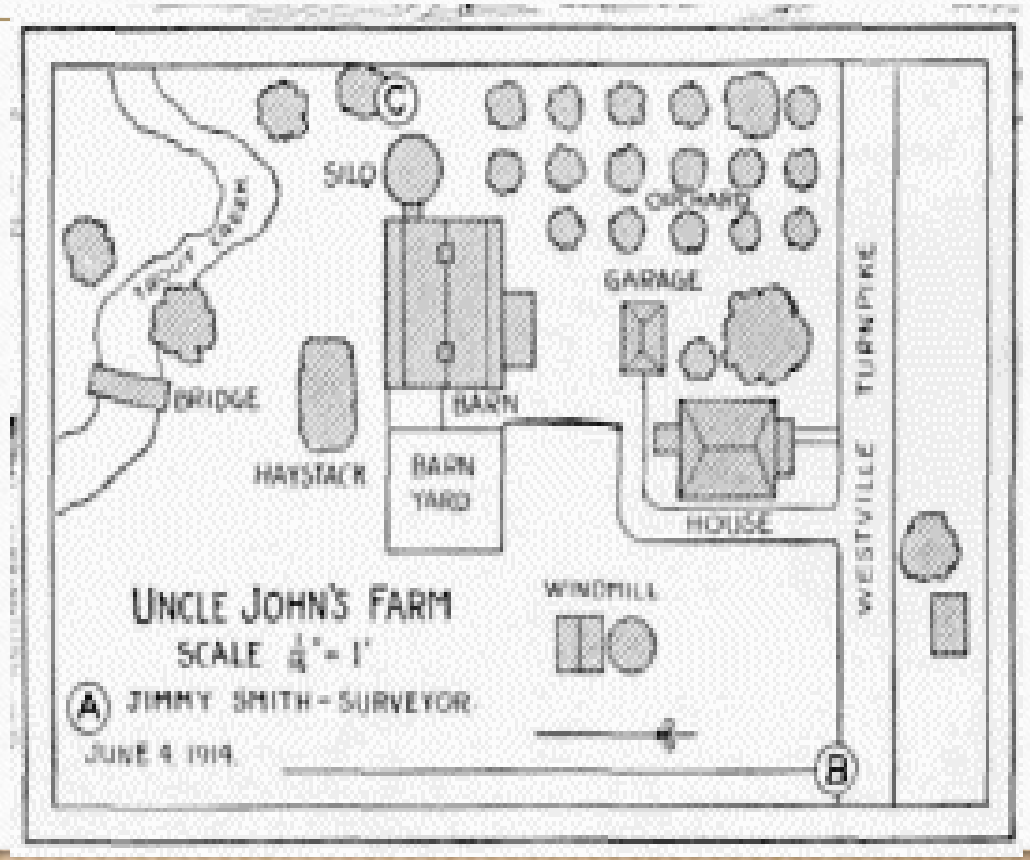
Whole to part, Redundancy, check

Plotting of details: Plotting accuracy

Principles of Surveying

1. ~~Reconnaissance (Rekey)~~
2. Control Network
3. Whole to part-Accuracy
4. Redundancy
5. Check line
6. Scale -R.F., EngrS., G.S.
7. Plotting details

-Plotting accuracy



Reconnaissance

An exhaustive preliminary survey of land to be surveyed.-*ground or aerial reconnaissance*

- ✓ Made on arrival to the site.
- ✓ The most suitable position of stations is selected.
- ✓ Survey and accuracy required will be drawn.
- ✓ Finally method of observation will be established.

Objectives of Reconnaissance

1) To ascertain the possibility of building or constructing route or track through the area.
2) To choose the best one or more routes and record on a map.
3) To estimate probable cost and draft a report.

Control Network

This type of survey, sometimes referred to as a traverse survey, is to establish control networks or survey stations along a line or path of travel. The previously surveyed points are then used as a reference to survey the next control along the line of travel.

A control point network, or control network is a network, often of triangles, which are measured exactly by techniques of terrestrial surveying or by satellite geodesy.

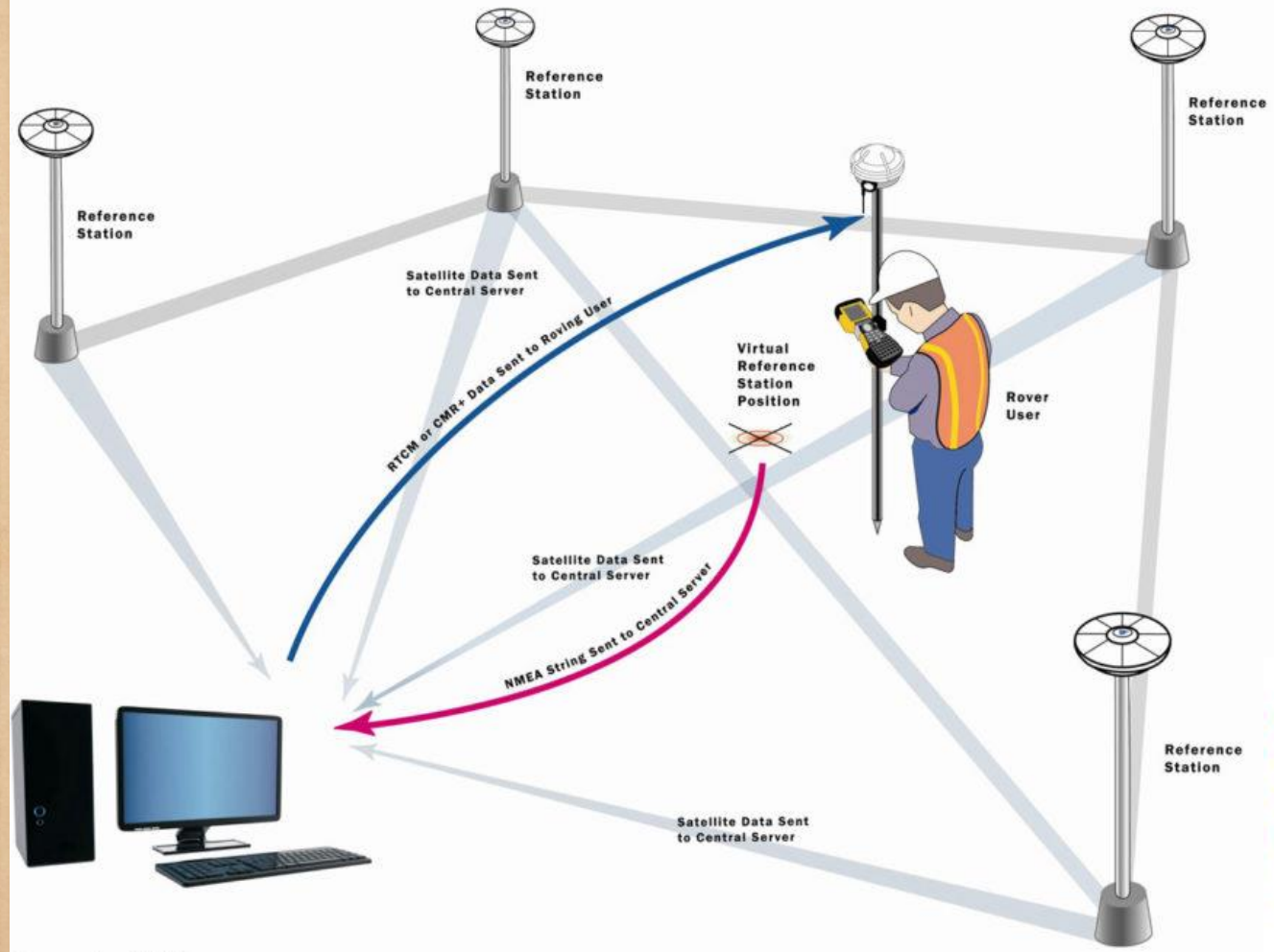
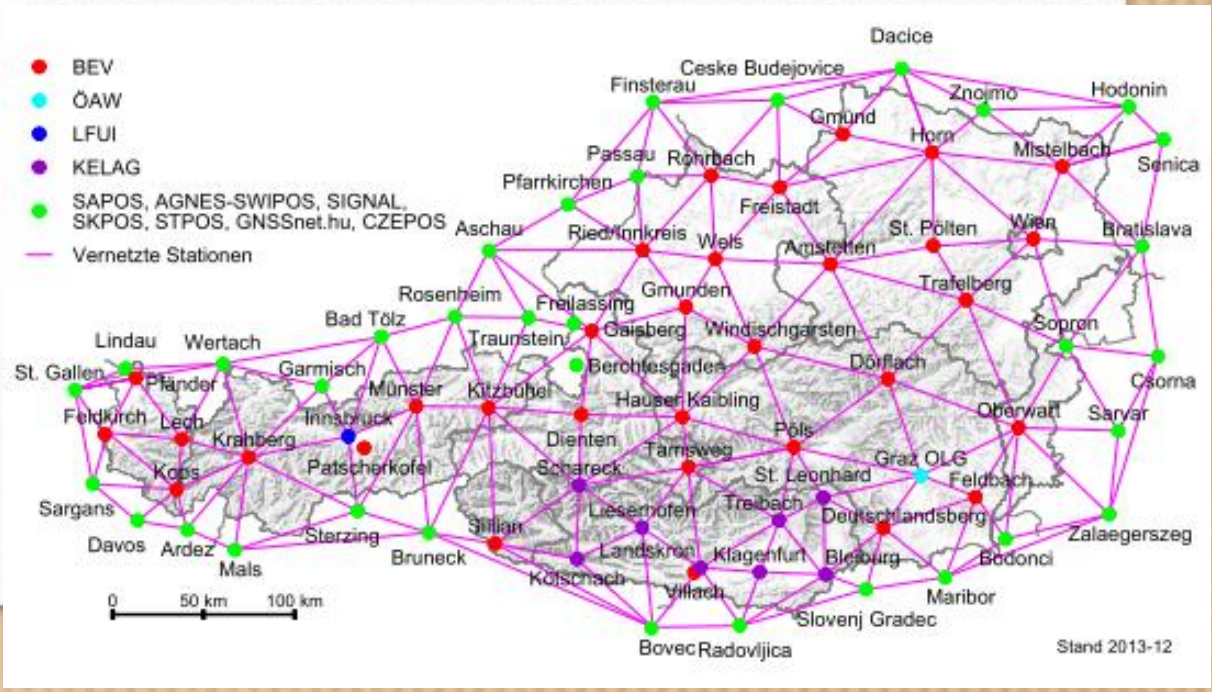


Image courtesy of Trimble

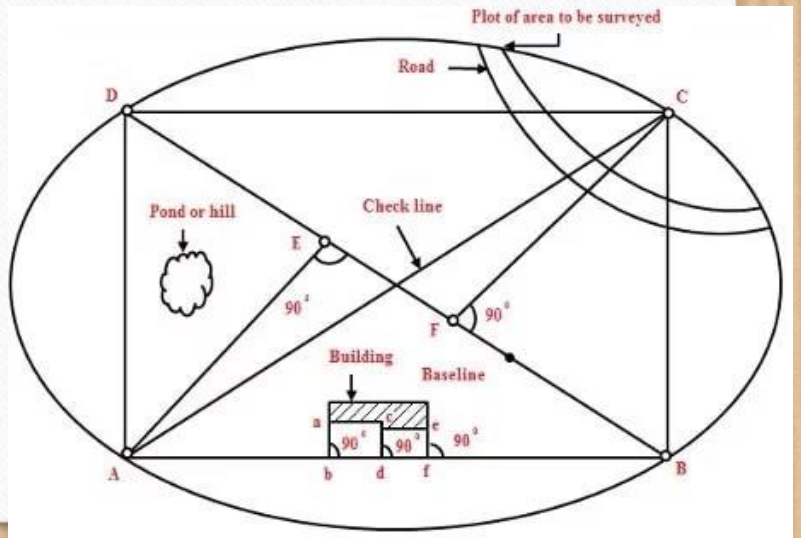


Working from whole to part

It is a fundamental rule that always

work from whole to the part.

- ✓ This principle involves laying down an overall system of stations whose positions are fixed to a fairly high degree of accuracy as control.
- ✓ Then the survey of details between the control points may be added on the frame by less elaborate methods.

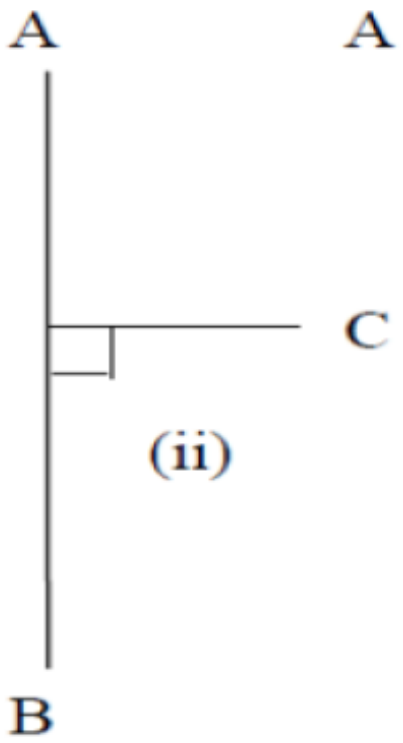


A simple networks of triangle in a plot of land to be surveyed

- ✓ Once the overall size has been determined, the smaller areas can be surveyed and put into the confines of main overall frame.
- ✓ Errors which may inevitably arise are then contained within the framework of the control points and can be adjusted to it.

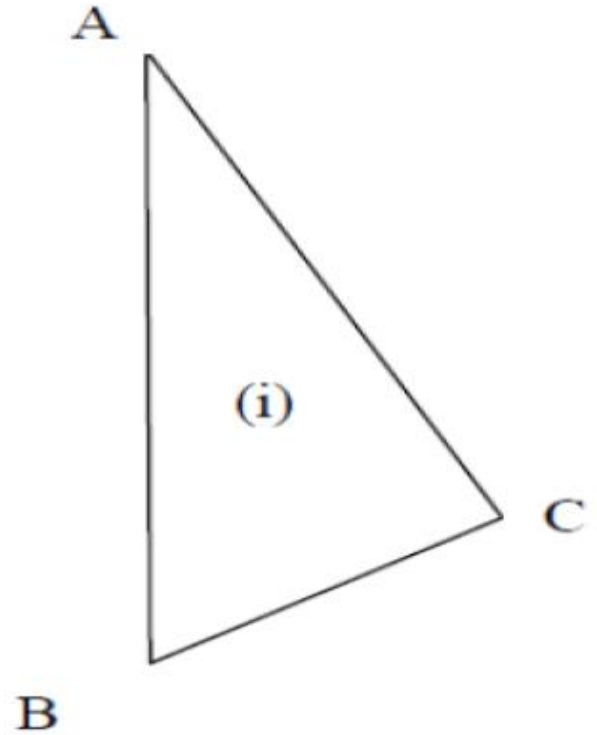
(a) Working from the whole to the part is achieved by covering the area to be surveyed with a number of spaced out control point called primary control points called primary control points whose pointing have been determined with a high level of precision using sophisticated equipments. Based on these points as theoretic, a number of large triangles are drawn. Secondary control points are then established to fill the gaps with lesser precision than the primary control points. At a more detailed and less precise level, tertiary control points at closer intervals are finally established to fill in the smaller gaps. The main purpose of surveying from the whole to the part is to localize the errors as working the other way round would magnify the errors and introduce distortions in the survey. In partial terms, this principle involve covering the area to be surveyed with large triangles. These are further divided into smaller triangles and the process continues until the area has been sufficiently covered with small triangles to a level that allows detailed surveys to be made in a local level. Error is in the whole operation as the vertices of the large triangles are fixed using higher precision instruments.

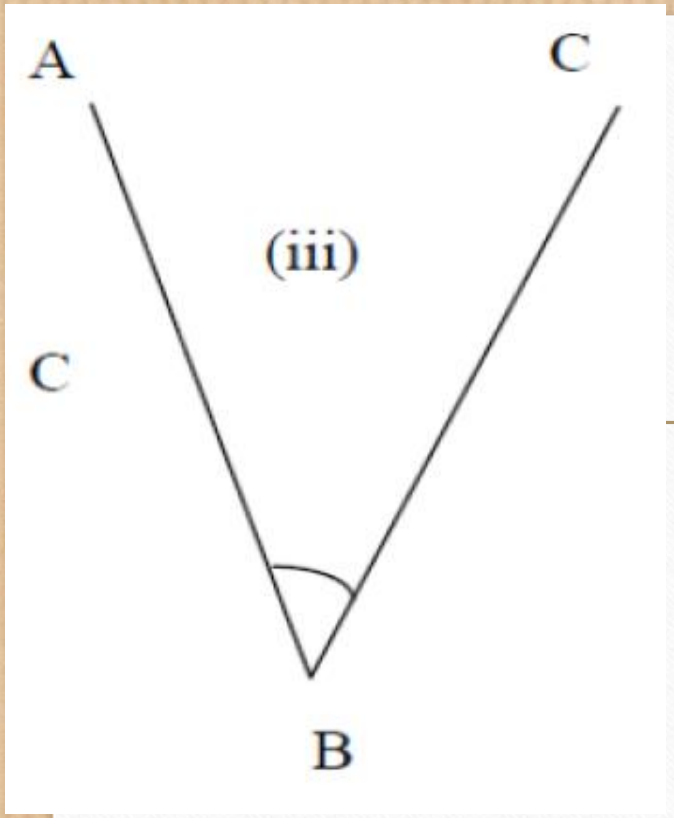
(b) Using measurements from two control parts to fix other points. Given two points whose length and bearings have been accurately determined, a line can be drawn to join them hence surveying has control reference points. The locations of various other points and the lines joining them can be fixed by measurements made from these two points and the lines joining them. For an example, if A and B are the control points, the following operations can be performed to fix other points.



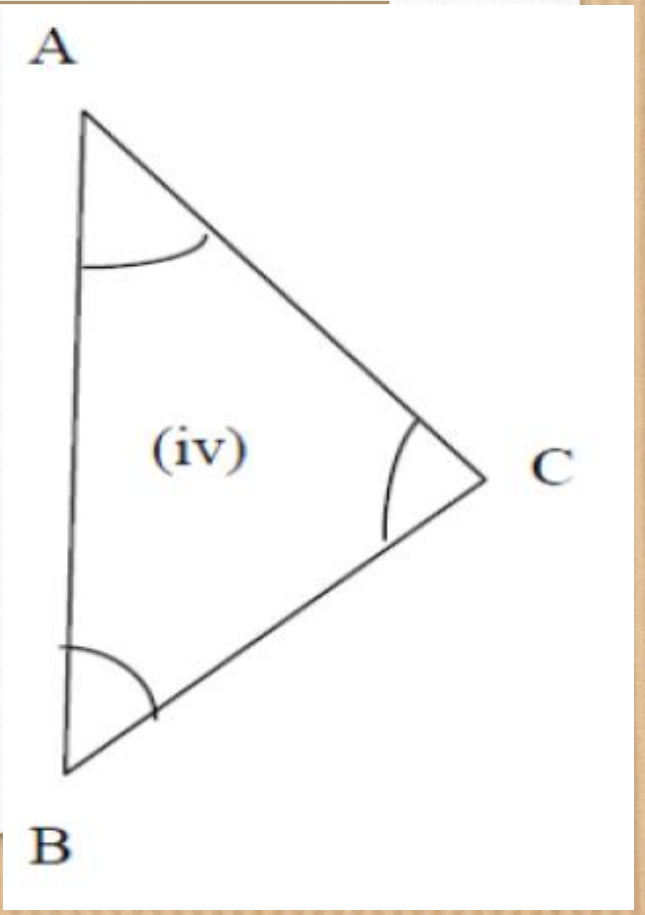
i. Using points A and B as the centers, ascribe arcs and fix (where the intersect)

ii. Draw a perpendicular from D along AB to a point C





iii. To locate C, measure distance AB and use your protractor to equally measure angle ABC



iv. To locate C, the interior angles of triangle ABC can be measured. The lengths of the sides AC and BC can be calculated by solving the triangle.

Accuracy and Precision

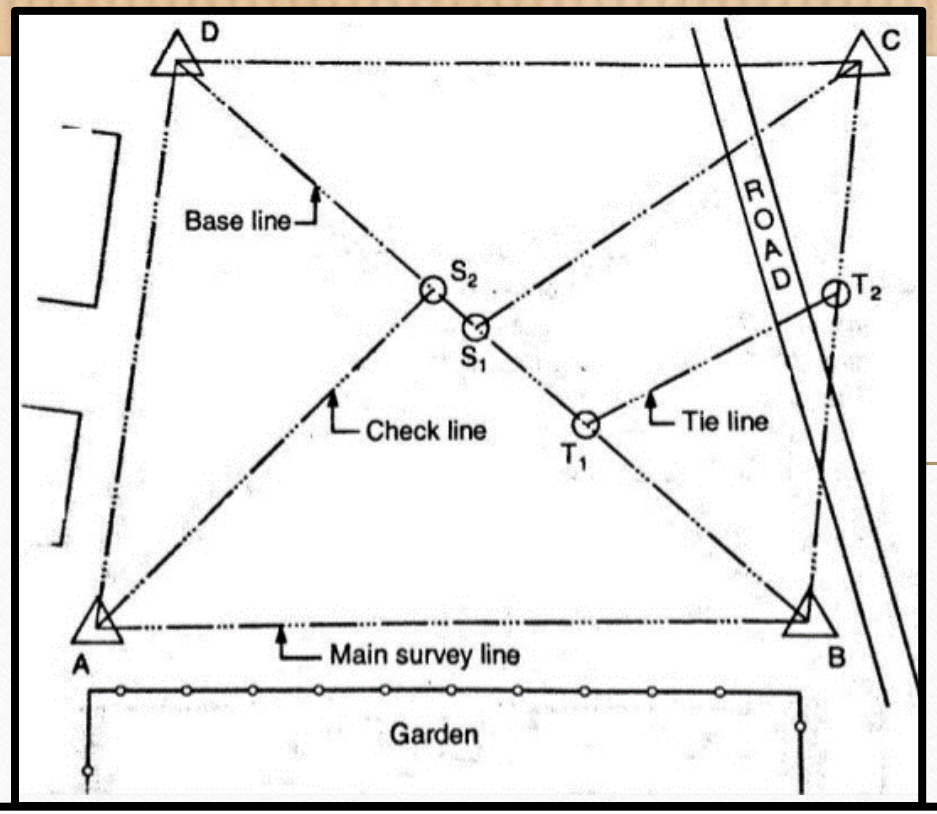
These terms are used frequently in surveying their equipment's and on site by surveyors to describe result obtained from the field.

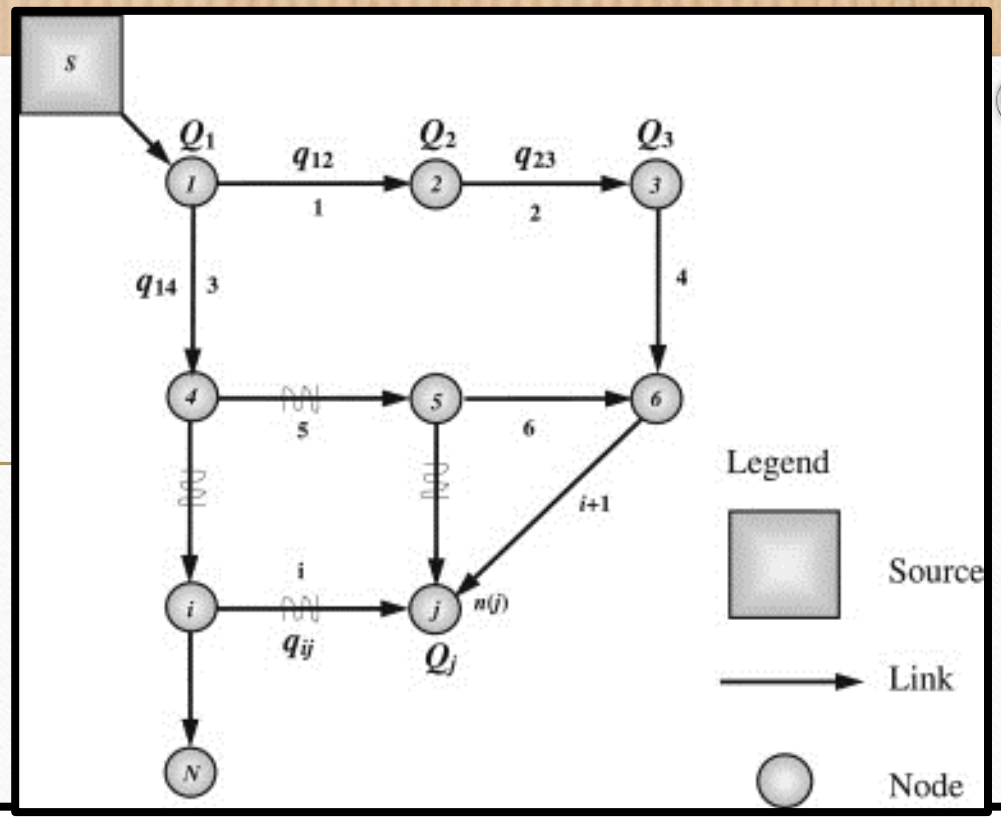
- ✓ Accuracy allows a certain amount of tolerance (+, _).
- ✓ Precision demands exact measurement. Since there is no such things as an absolutely exact measurements.
- ✓ A set of observation that are closely grouped together having small deviations from the sample mean, have small standard error and are said to be precise.

-Redundancy is the duplication of critical components/measurements or functions of a system with the intention of increasing reliability.

-Check line joints two fixed points on the main survey lines. It helps to checking the accuracy of surveying and to locate the interior details.

The scale of a map is the ratio of a distance on the map to the corresponding distance on the ground. –Representative, Engineering, Graphical scales.

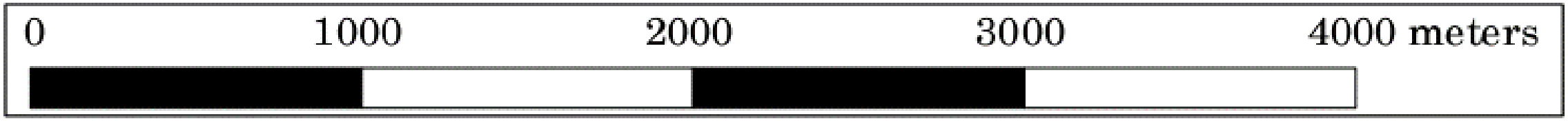




a) (1 centimeter represents 250 meters)

b) 1: 25 000

c)



Plotting Details

-Plotting is a graphical technique for representing a data set, usually as a graph showing the relationship between two or more variables. The plot can be drawn by hand or by a mechanical or electronic plotter.

Plotting Accuracy

-The precision of a map/plan depends on the fineness and accuracy with which the details are plotted. Moreover, the plotting accuracy on paper, varies between 0. 1 mm to 0.4 mm, of which the mean value of 0.25 mm is usually adopted as plotting accuracy.