

SURVEYING-I

Presented By
Dr T. V S Varalakshmi
Assisitant Professor,
Dr Y S R ANUCET, ANU

SURVEYING-I

Definition :

Surveying is the science and art of determining the relative positions of points above, on, or beneath the earth's surface and locating the points in the field.

Objectives :

- The data obtained by surveying are used to prepare the plan or map showing the ground features.
- When the area surveyed is small and the scale to which its result plotted is large then it is known as **PLAN**.
- When the area surveyed is large and the scale to which its result plotted is small then it is called as a **MAP**.
- Setting out of any engineering work like buildings, roads, railway tracks, bridges and dams involves surveying.

Uses of Surveying

- To prepare a topographical map this shows the hills, valley, rivers, villages, town, etc, of a country.
- To prepare a cadastral map showing the boundaries of fields houses, and other properties.
- To prepare archeological map including places where ancient relics exist.
- To prepare a geological map showing areas including underground resources.

Types of Surveying

- Classification

- A. Primary Classification or Primary Division :

1. Plane surveying
2. Geodetic surveying

1. Plane Surveying

- The shape of the earth is spherical. Thus the surface is obviously curved.
- But in plane surveying, the curvature of earth is not taken into account.
- This is because plane surveying is carried out over a small area, so the surface of the earth is considered as a plane.
- The degree of accuracy required in this type of surveying is completely low.
- Plane surveying is done on an area of less than 250 sq.km.

2. Geodetic surveying

- In geodetic surveying the curvature of the earth is taken into consideration.
- It is extended over a large area greater than 250 sq.km.
- The line joining any two points considered as a curved line.
- Very refined methods and instruments are used in this type of surveying.
- In this method very high precision or accuracy is required.

B. Secondary Classification

- Survey can be classified on different bases:

1. Based on instrument:

- Chain Survey
- Compass survey
- Plane Table survey
- Theodolite survey
- Tacheometric Survey
- Photographic survey

2. Based on methods:

- Triangulation Survey
- Traverse Survey

3. Based on Objects:

- Geological survey
- Mine survey
- Archeological Survey
- Military survey

4. Based on nature of field

- Land Survey
- Marine survey
- Astronomical survey

Principles of surveying

1. Always work from whole to part and not from part to whole.
2. New points should be fixed by at least two independent measurements.

The purpose of working from whole to part is

- to localise the errors and
- to control the accumulation of errors.

Basic Measurements

- Horizontal angles
- Horizontal distances
- Vertical angles
- Vertical distances
- Slope distances

- ❖ Direct measurements
- ❖ Indirect measurements

Units of Measurements

- Length
- Angle
- Area
- Volume

Phases of survey work

The entire work stages of survey operation in civil engineering may be divided into the following three stages:

- Field work
- Office work
- Care and adjustment of instruments

Field Work

The field work consists of the measurement of all the necessary horizontal and vertical distances, horizontal and vertical angles, elevations, etc. and keeping a systematic record of what has been done in a field book. Field work is further subdivided into

- (i) Reconnaissance
- (ii) Field measurements or observations
- (iii) Field record.

❖ Reconnaissance

During reconnaissance, the surveyor examines the area to be surveyed in order to know how the survey work can be performed in the best possible ways. He will fix a number of stations to establish a system of horizontal controls. He will also make a rough sketch of the area showing the stations and some permanent features including the north line. The sketch is not prepared according to scale, but it should represent the approximate positions of different features in the area so that it becomes a good guide for further work.

❖ **Field Measurements**

The surveyor takes all linear and angular measurement with survey instruments. The measurement includes horizontal and vertical distance, horizontal and vertical angles, etc. Method of measurement depends upon the nature of the terrain, type of instruments and the method of surveying.

❖ **Field Record**

All the measurements are recorded in a field book. The field records may be numerical values, sketches and explanatory notes. Every care is made to ensure correct entries of all the observations; otherwise the survey may be useless. The competency of a surveyor is judged by his field records.

Office Work

The office work of a surveyor consists of three types based on the field records.

- (i) Drafting
- (ii) Computing
- (iii) Designing

Drafting

- This process consists of preparation of plans, longitudinal sections and cross-sections by plotting the field measurements to the desired scale.

Computing

- This process consists of calculating data necessary for plotting and determining the areas and volumes of earthwork.

Designing

- This process consists of selecting the best alignment of roads, railways, canals, etc. on the plotted plan.

Care & Adjustment of Instruments

A great care is required to handle the survey instruments both in field and office. A beginner should always be made familiar with care and adjustment of the instruments and their limitations. Precise instruments like theodolite, level, prismatic compass, etc. need more care than the equipment such as chains, arrows, ranging rods, etc.

Duties of surveyor

- He should plan his work systematically.
- He should work carefully and accurately.
- He should record the observations in a neat and orderly fashion.
- He should know the relative importance of various measurements and should develop some sense of proportion as to what is important and what is not.
- He should have the essential habit of checking measurements and calculations.