

UNIT IV

ADVANCED TOPICS IN SURVEYING

Introduction :

Photogrammetry : Introduction

Terrestrial and aerial photographs

Stereoscopy

Parallax

Electromagnetic distance measurement

Carrier waves

- Principles - instruments

Trilateration,

Hydrographic Surveying :

Tides

MSL

Sounding Methods

Location of soundings 4 methods

Three point problem

Strength of fix

Sextants & station pointer

River surveys

Measurement of current & discharge.

Cartography :

- Cartographic concepts & techniques
- Cadastral surveying.
- Definition
- Uses
- Legal values
- Scales and accuracies.

Photogrammetric Surveying :

Photogrammetric Surveying or photogrammetry is the science and art of obtaining accurate measurements by use of photographs, for various purpose such as the construction of planimetric and topographic maps, classification of soils, interpretation of geology, acquisition of military intelligence and the preparation of composite pictures of the ground.

The photographs are taken either from the air or from station on the ground. Terrestrial photogrammetry is that branch of photogrammetry where photographs are taken from a fixed position on or near the ground. Aerial photogrammetry is that branch of photogrammetry wherein the photographs are taken by a camera mounted in an aircraft flying over the

Mapping from aerial photographs is the best mapping procedures yet developed for large projects, and are invaluable for military intelligence. The major users of aerial mapping methods are the civilian and military mapping agencies of the Government.

The conception of using photographs for purpose of measurement appears to have originated with the experiments of Aimé Laussedat of the Corps of the Army who in 1851 produced the first measuring camera.

Principles behind Terrestrial Photogrammetry:

The principle of terrestrial photogrammetry was improved upon and perfected by Capt. Deville, then Surveyor General of Canada in 1888. In terrestrial photogrammetry, photographs are taken with the camera supported on the ground. The photographs are taken by means of a photo theodolite which is a combination of a camera and a theodolite. Maps are then compiled from the photographs.

The principle underlying the method of photogrammetry is exactly similar to that of plane table surveying i.e if the directions of same objects photographed from two extremities of measured base are known, their position can be located by the intersection of two rays to the same object.

However the difference between this and plane tabling is that more details are obtained from the photographs and their subsequent plotting etc. is done by the office while in plane tabling all the detailing is done in the field itself.

The terrestrial photogrammetry can be divided into two branches.

1. Plane table photogrammetry.

2. Terrestrial stereo photogrammetry.

The Shore line Survey:

The shore line survey consist of

1. Determination or delineation of shore lines

2. Location of shore details and prominent features to which soundings may be connected.

3. Determination of low and high water lines for average spring tides.

The determination of delineation or shore line is done by traversing along the shore and taking offset to the water edge by tape, or stadia or plane table.

If the river is narrow, both the banks may be located by running a single line of traverse on one bank. For wide rivers however the traverse may be run along both the banks. The traverse should be connected at convenient intervals to check the work.

Soundings & the methods employed in sounding:

The measurement of depth below the water surface is called sounding. This corresponding to the ordinary spirit leveling in land surveying where depths are measured below a horizontal line established by a level. Here, the horizontal line or the datum is the surface of water, the level of which continuously goes on changing with time. The object of making soundings is thus to determine configuration of the sub aqueous surface.

1. Making nautical charts for navigation.

2. Measurement of areas subject to scour or silting such to ascertain the quantity of dredging material.

Small equipment for soundings:

- i) Sounding board
- ii) Sounding rod or poles
- iii) Dead lines
- iv) Sounding machine.
- v) Fathometer.

Components of echo sounding instrument:

1. Transmitting and receiving oscillator.
2. Record unit.
3. Transmitter/ power unit.

Echo sounding consist of recording the interval of time between the emission of sound impulse direct to the bottom of the sea and the reception of the wave or echo, reflected from the bottom.

If the speed of sound in water is v and the time interval between the station transmitter and receiver is t . The depth given by,

$$h = \frac{1}{2}vt.$$

Advantages:

1. It is more accurate as a truly vertical sounding is obtained. The speed of the vessel does not deviate it appreciably from the vertical.

2. It can be used when a strong current is running and when the weather is suitable for the soundings to be taken with the lead line.
3. It is more sensitive than the lead line.
4. A record of the depth is plotted immediately and provides a continuous record of the bottom as the vessel moves forward.
5. A speech of sounding and plotting increased.
6. The error due to estimation water level in a choppy sea is reduced owing to the instability of the boat.
7. Rock underlying softer material is recorded.

Method employed in locating sounding:

The soundings are located with reference to the

shore traverse by observations made

i) entirely from the boat.

ii) entirely from the shore

iii) from both.

The following are methods of location.

1. By cross rope.

2. By range and time intervals

3. By range and one angle from the shore

4. By range and one angle from boat

5. By angles from the boat.

6. By two angles from the shore.

7. By one from boat & one from shore

8. By intersecting ranges

9. By tacheometry.

Range : A range or range line is the line on which soundings are taken. They are in general laid perpendicular to the shore line and parallel to each other if the shore is straight or else arranged relating from a prominent object when the shore line is very irregular.

Shore Signals :

Each range line is marked by means of signals erected at two points on it or a considerable distance apart. Signals can be constructed by variety of ways. They should be readily seen easily distinguished from each other.

Tides :

All celestial bodies exert a gravitational force on each other. These forces of attraction between earth & other celestial bodies cause periodic variations in the level of water surface commonly known as tides.

1. Lunar tides.

2. Solar tides.

Mean Sea Level :

For all important surveys, the datum is selected

as the msl at a certain place. The mean sea

level may be defined as msl of sea obtained by taking

the mean of the all height of tides - as measured

hourly intervals over some stated period covering

a whole number of complete tides.

Astronomical Survey:

Celestial Sphere:

The millions of stars we see in the

sky on a clear cloudless night are all at varying distances from us. Since we are concerned with their relative distance rather than their actual distance.

Zenith, Nadir & Horizon:

The zenith (z) is the point on the upper portion of the celestial sphere marked by plumb line above the observer.

The Nadir (z') is the point lower portion of the celestial sphere marked by the plumb line below the observer.

Celestial Horizon - It is a great circle traced upon the celestial sphere by that plane which is perpendicular to the zenith nadir line and which passes through the centre of earth.