SNS COLLEGE OF TECHNOLOGY

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COIMBATORE

DEPARTMENT OF CIVIL ENGINEERING

19GET102 – BASIC CIVIL AND MECHANICAL ENGINEERING

I YEAR / I SEMESTER

Unit 1 : Civil Engineering Materials and Surveying

Topic : Surveying

Surveying

- Surveying is the technique of determining the relative position of different features on, above or beneath the surface of the earth by means of direct or indirect measurements and finally representing them on a sheet of paper known as plan or map.
- Surveying is the science and art of making all essential measurements to determine the relative position of points or physical and cultural details above, on, or beneath the surface of the Earth, and to depict them in a usable form, or to establish the position of points or details.

Surveying

- Surveying also includes the technique of establishing points by predetermined angular and linear measurements.
- From the plans, sections, and maps prepared by surveying, the area and volume of a particular plot of land can be calculated.
- A map represents the horizontal projection of the area surveyed and not the actual area. But the vertical distance can be represented more correctly by drawing sections.
- During a survey, surveyors use various tools to do their job successfully and accurately, such as total stations, GPS receivers, prisms, 3D scanners, radio communicators, digital levels, dumpy level and surveying software etc.

Importance of Surveying

- The first necessity in surveying is to prepare a plan and a section of an area to be covered by the project. From these prepared maps and sections the best possible alignment, amount of earthwork and other necessary details depending upon the nature of the project can be calculated.
- The planning and design of all Civil Engineering projects such as railways, highways, tunneling, irrigation, dams, reservoirs, waterworks, sewerage works, airfields, ports, massive buildings, etc. are based upon surveying measurements.
- During execution of the project of any magnitude is constructed along the lines and points established by surveying.
- The measurement of land and the fixation of its boundaries cannot be done without surveying.
- The economic feasibility of the engineering feasibility of a project cannot be properly ascertained without undertaking a survey work.
- The execution of hydrographic and oceanographic charting and mapping requires.
- Surveying is used to prepare a topographic map of a land surface of the earth.

Types of Surveying

Surveying can mainly be classified into 2 groups-

1. Plane Surveying
2. Geodetic or Trigonometrical Surveying

Plane Surveying

Plane surveying deals with small areas on the surface of the earth assuming the surface of the land to be plane. So curvature of the earth is neglected. Plane surveying can further be subdivided in the following ways:

Chain Surveying

- Area to be surveyed is divided into a number of triangles
- The length of the sides are measured and the interior details recorded
- Whole are then plotted on a drawing sheet to a suitable scale to produce the map

Traverse Surveying

- The plot of the plan is enclosed by a series of straight lines making angles with each other.
- The length of the lines and angles are measured and plotted with details on a drawing paper to a suitable scale to produce the map

Plane Surveying

Plane Table Surveying

- The observations and plotting are done simultaneously
- An art paper or sheet is fixed on a calibrated plane table
- The field observations are taken and recorded side by side on the paper and eventually the map is prepared.

Ordinary Leveling

- The elevations of different points on the earth surface are determined.
- Provides all the elevation data needed for construction activities

Geodetic Surveying

Geodetic surveying deals with vast areas, so curvature has to be considered. Geodetic surveying can be subdivided in the following ways:

Triangulation

- A network of well-defined triangles is formed on the plot of land to be surveyed.
- One of the lines is considered as the baseline, all other lines and angles are then measured accordingly.

Reciprocal Leveling

- Used in leveling across streams, gullies, and other obstructions to eliminate instrumental errors
- Level readings are taken from two setups at two different points
- The difference in levels between two sites with obstructions is determined through this survey

Geodetic Surveying

Tacheometry or Stadia Surveying

- A telescopic sight instrument is used to measure distances
- It incorporates a theodolite controlled by an operator and a level staff held by another surveyor at a distance.
- Both vertical and horizontal distances are computed through stadia (the two horizontal markings on a theodolite) readings

Astronomical Surveying

- The meridian, azimuth, latitude, longitude, etc. of the plot to be surveyed is determined with the help of celestial bodies.

Photographic surveying

- Maps are prepared from photographs taken from suitable camera stations; the stations can be even airplanes.
- The output is a map, a drawing or a 3D model of some real-world scene or object.

Objectives of Surveying

- Surveying is the means of determining the relative position of points and the relative distances. It is very important in the field of Civil Engineering. We can find uses of surveying in all civil engineering projects. The objectives of surveying may very depending on the type of project. A surveyor must be clear about the objects of surveying. The main objectives of surveying are discussed below.

1. To determine the relative position of any objects or points of the earth.
2. To determine the distance and angle between different objects.
3. To prepare a map or plan to represent an area on a horizontal plan.
4. To develop methods through the knowledge of modern science and the technology and use them in the field.
5. To solve measurement problems in an optimal way.

Principles of Surveying

- Surveying is the process of finding the relative position of various points on the surface of the earth by measuring distance among them and setting up a map to any reasonable scale.
- Various methods of surveying are established on very simple fundamental principles. The surveying basic principles can be stated under two aspects.

1. To locate the position of a point by measurement from two reference points
2. To work from whole to part

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Uses of Surveying

- Topographical maps showing hills, rivers, towns, villages, forests etc. are prepared by surveying.
- For planning and estimating new engineering projects like water supply and irrigation schemes, mines, railroads, bridges, transmission lines, buildings etc. surveying is required.
- Cadastral Map showing the boundaries a field houses and other properties are prepared by surveying.
- Engineering map showing the position of engineering works like roads, railways, buildings, dams, canals etc. are prepared through surveying.
- To set out a work and transfer details from map to ground knowledge of surveying is used.
- For planning navigation routes and harbors, marine and hydro-graphic surveying are used.
- To help military strategic planning, military maps are prepared by surveying.
- For exploring mineral wealth, mine survey is necessary
- To determining different strata in the earth crust, geological surveys are required
- Archaeological surveys are used to unearth relics of antiquity.

Thank You!!