GIDC ENGINEERING COLLEGE, &BR&M&, N&VS&RI (INTRODUCTION OF SURVEYING)

(Automobile Engineering) 1.Bhathena Urvaksh.P(LEADER) 2.Bhalara Hardik.G 3.Barad Yaspal.J 4.Babariya Sagar.K 5.Ahir Sagar.A Guided by : Pritesh R Rathod

SURVEYING

Defination of surveying : -

Surveying is the art of determining the relative positions of points on , above , or below the surface of the earth. The relative position are determined by measuring horizontal distance & angle , vertical distance & angle accurately using various surveying instruments.

After taking measurement in the field , calculations are done in office and plans and maps are prepared.

 Which is used for planning of engineering projects, selection of site for project, marking boundaries, to show engineering features like – building, roads, railways, dams, canals, etc. **LEVELING** : - It is a branch of surveying which deals with measurement of relative heights of the points on the surface of the earth in a vertical plane.

PURPOSE OF SURVEYING :

1) Taking measurements to determine relative positions of the of points.

2) To determine area and volume.

3) To mark position of buildings, canal, road etc.

 To prepare plans and maps to show relative positions of objects.

5) To fix boundaries of district , states , & country.

Use of surveying -

To prepare -

3)

4)

5)

8)

- Topographical map to show features like rivers , hills , forest , buildings , railway , dams , canal etc.
- Cadastral map to show boundaries of fields , plots etc.
- Contour map to know topography of area to find best possible site for project.
- To fix centre line of road , railway , canal , tunnel , bridge , electrical tower etc.
- To lay slope for water supply , drainage , gas line or road project.
- To plot irregular boundaries of plot and structures.
- To find level difference between points on ground.
- For military survey to find location of strategies importance.
- For city survey for street , water supply , sewer system etc.
-) To transfer details from the map on the ground.

PRIMARY DIVISION OF SURVEY --

Considering curvature of the earth,

PLANE SURVEYING
GEODETIC SURVEYING

Curved line

Spherical triangle

Spherical angle

Plane triangle

- Plane angle

Straight line

Plane surveying :-

- Curvature of the earth surface is not considered.
 - Line joining two points considered as straight line.
- Triangle formed by three points considered as a plane triangle and angle of triangles as plane angle.
- Accuracy is low.

1

- Used for the survey of small area less than 250 sqkm.
- Carried out by local or state agencies like
 R &B and Railway department.

Jeodetic survey:-

Curvature of the earth surface is considered.

- Line joining two points considered as curved line.
- Triangle formed by three points considered as a spherical triangle and angle of triangles as spherical angle.
 Accuracy is high.
 - Used for the survey of large area more than 250 sqkm.
- Carried out by Survey of Indian Department.

Fundamental Principal of Surveying :1) TO WORK FROM WHOLE TO PART
2) TO LOCATE A NEW STATION BY AT LEAST TWO MEASUREMENT

1) To work from whole to part-

Principal state that - first establish control points (main stations) with high accuracy. Then subdivide area into small areas by well conditioned triangle (angle > 30 ° & < 120°) with slight less accuracy. Object - to prevent accumulation of errors in survey work.

<u>To work from whole to part</u>

A,B,C, - MAIN CONTROL POINTS P,Q,R, ,X,Y,Z - MINOR CONTROL POINTS ABC - MAIN TRIANGLE

XYZ - SUBSIDARY TRIANGLE

Х

 \mathbb{Z}

First of all control points A ,B,C are fixed with great accuracy & frame work ABC is prepared. Main survey line AB, BC, CA measured with high accuracy Main framework is subdivided in to small triangles PQR & XYZ by method of triangulation. Sides of this triangles measured with less accuracy. Details within this triangles are surveyed with less accuracy.

o locate a new station by at least two measurement



If two control points are established first then a new station can be located by By two linear measurement
By two angular measurement
By one linear and one angular measurement.
Various methods of locating point

C, with respect to A & B area as follow:

 Let A & B are two control points on the surface of the earth.

 Measure distance AB accurately on field and relative position of A & B are plotted on the sheet to some scale.



CASE -1 - by two linear measurement

Measure distance AC and BC on field
Then on paper as per the scale of line AB take the distance for AC and mark ARC from A.

Repeat the same process for line BC. Intersection of two ARC drawn from A & B will give the new point C on paper.

CASE -2 - by two linear measurement

On ground from point C lay a perpendicular CD such that point D comes on Line AB.

Measure the distance AD and CD on the field.

Now as per the scale of line AB mark point D on line AB.

From point D draw a line DC as per the scale to get point C on the paper.



CASE -3 - by one angular and one línear measurement Angle ABC is measured on field with the help of angle measuring instrument - that is - θ • Linear measurement of line BC is also taken in the field. With the help of protector measured angle in field is drawn from point B, then line BD is drawn from point B. On line BD mark the distance BC of the ground as per the scale to get point C on paper.



CASE -4 - by two angular measurement

Angle BAC is measured on field with the help of angle measuring instrument – that is – θ 1.

Angle ABC is measured on field with the help of angle measuring instrument - that is $- \theta 2$.

With the help of protector measured angle in field – i.e. $\theta 1$ & $\theta 2$ is drawn as line AD & BE from point A & B ,

Intersection of line AD and BE will give the new point C on the paper.



CASE-5 - by one angular and one linear measurement

Angle ABC is measured on field with the help of angle measuring instrument - that is $- \theta 1$ Length of a line AC is measured on the field . With the help of protector measured angle in field – i.e. θ 1 is drawn as line BE from point B From Point A draw a arc - AC of field measurement as per the scale on line AB.

Intersection of arc on line BE will give the new point C on the paper.

CLASSIFICATION OF SURVEYING

Surveying is classified based upon

Instrument used Method Purposes 4. Nature of field

19

2.

3.

(1) Based upon instrument used:

1.1 ~ Chain survey

Simplest type of surveying. Only linear measurement are taken with chain or tape.

1.2 - Compass surveying

Angular measurement are taken with the help of a magnetic compass.

1.3 - Chain & Compass survey

 Linear and angular measurements are taken with the help of chain/tape & magnetic compass respectively.

1.4. - Plane table survey

Graphical method of surveying.
Measurement and plotting (preparation of drawing) both are done together.

1.5. - Theodolite survey

 Linear & Angular measurement are taken in horizontal direction.

Linear measurement by chain/tape and angular measurement are taken more accurately with instrument called theodolite.

1.6 - Tachometry

It is a special type of theodolite.

Used to find horizontal and vertical distances indirectly.

1.7. - Leveling survey

 Used to find vertical distance and relative heights of points.

Instrument used is Level.

1.8. - Photogrammetric survey

Aerial photographs by camera are taken from air craft.

Then measurement are find from this photograph.

1.10. - EDM survey

All type of measurements like - length , height , angle etc. are measured by a single instrument.
i.e. - by Electronic Distance Meter (total station).

(2) Based upon Method used:

2.1 - Triangulation survey

Basic method of surveying.

 When survey area is comparatively small this method is adopted.

Entire area is divide into a network of well conditional triangles and details are collected.

Length of sides of triangles are measured with chain or tape.

No angular measurements area taken.

2.2 - Traversing survey

It is circuit of connected survey lines.
Traverse - may be open or closed.
Linear and angular measurement are taken with chain/tape and compass respectively.



(3) Based upon purposes 3.1 - Geological survey

Conducted to locate minerals and rocks.
On the surface and below the surface of the earth
Features like – folds , faults are also located.

3.2 - Mine survey

Conducted for exploration of minerals deposits - on and below the surface of the earth. Also to guide tunneling operation related to mining.

3.3 - Archaeological survey

Conducted to locate relics of antiquity – civilization kingdom , forts , temples etc.

3.4 - Military survey

Aerial survey is carried for this purpose Conducted to locate strategic locations for army operations.

(4) Based upon Nature of Field

4.1 - Land survey

Conducted to prepare plans and maps of a given area. Examples - Topographical , city , cadastral - survey.

4.2 - Hydrological survey

Conducted near water bodies like lack , river , sea etc. Conducted to locate shore line of water bodies.

4.3 - Astronomical survey

Conducted to find latitudes , longitudes , local time for different places on the earth. Things are find by observation of sun and stars.

4.4 - Aerial survey

Aerial survey is carried out from aircraft.

Photographs of earth surface are taken in overlapping manner. This photographs are then combined and used for study and different purpose.

Also known as photographic survey.

PLAN

MAP

A plan is the graphical representation to some scale, of the features on, near, or below the surface of the earth as projected in horizontal plane If the scale of the graphical representation on a horizontal plane is small, it is called map.

A plane is drawn on a large • A map is drawn on a small scale scale.

Scale : 1cm = 10 m or < 10 m

On a plan generally horizontal distance and directions are shown:

A plan is drawn for small area e.g. - plan of house , plan of bridge. Scale : 1cm = 100 m >100m

On a map vertical distances are also shown by counter line.

A map is drawn for large area e.g. - map of Gujarat , map of India.

Scale : -

In surveying , measurement taken on the field , cannot be drawn to same size on the paper.

- In that case drawing is prepared by increasing or by reducing the actual size.
- The ration by which the actual length of the object is reduced or increased is known as scale.
- It is defined as the ratio of distance on drawing sheet to the equivalent distance on the ground.
- If a line 1 cm long on the drawing sheet represent 10 m on the ground , scale can be expressed as 1 cm = 10 m.

Representative Fraction (R.F.):-

R.F. = (distance of object on drawing) / (corresponding distance of object on ground)

If scale is 1 cm = 10 m

- R.F. = 1 cm / 10 m
 - = $1 \text{ cm} / (10 \times 100) \text{ cm}$
 - = 1 / 1000 or 1 : 1000

