

I) Chain surveying

- 1.1 [Classifications and basic principles of surveying](#)
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II) Compass surveying

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1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

1.1.1 Surveying definition and classifications

“Surveying is the art of and science of determining the relative positions of various points or stations on the surface of the earth by measuring the horizontal, vertical distances and angles”

Primary Divisions of Surveying:

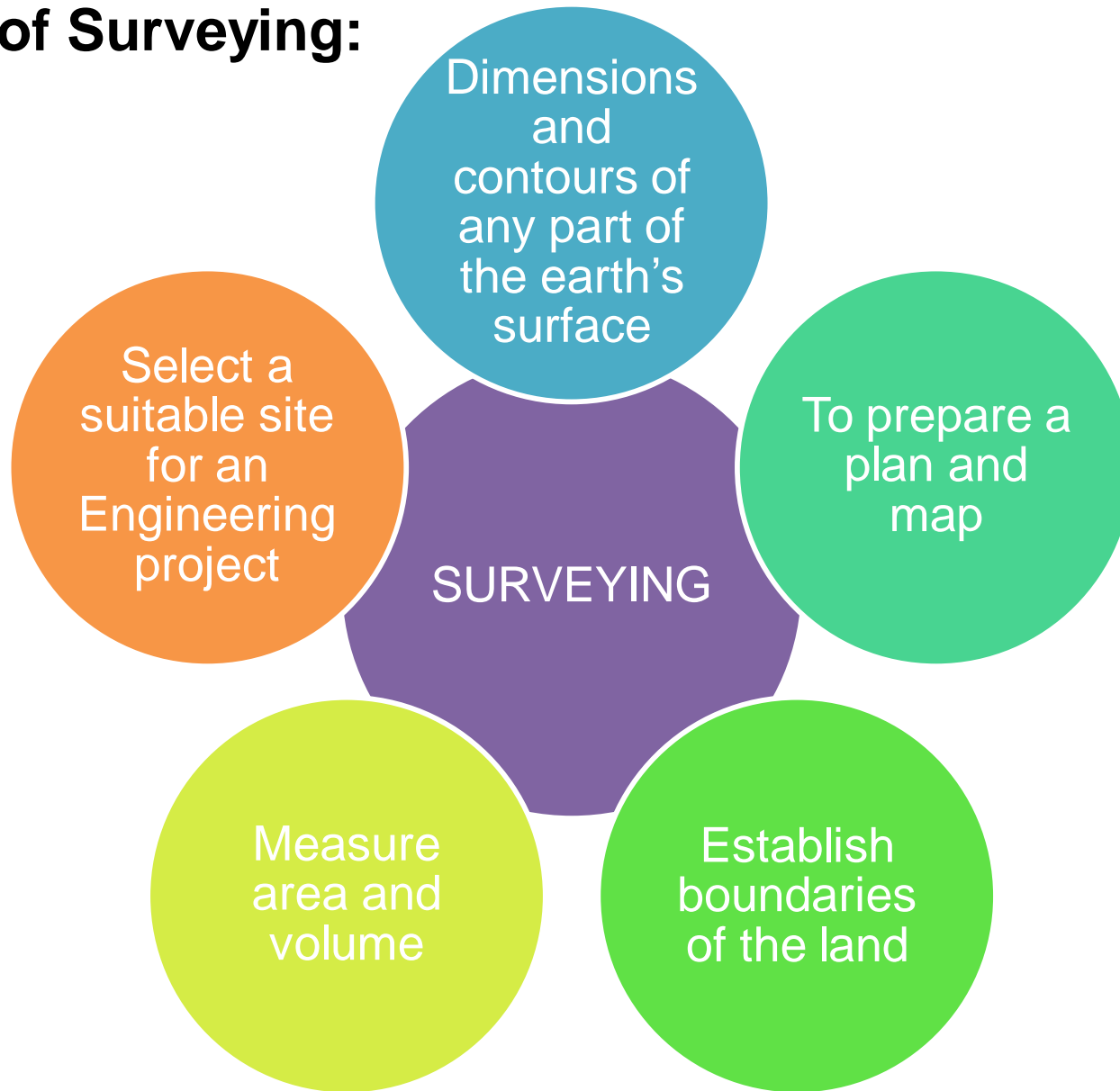
- Plane surveying - Curvature of the earth is ignored
Survey area $< 20 \text{ Km}^2$
- Geodetic Surveying - Curvature of the earth is considered
Survey area $> 20 \text{ Km}^2$

Video Reference:

<https://drive.google.com/file/d/11SBldPL8IAHbW-4gneAc3ZVISy2oH1TG/view>

1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

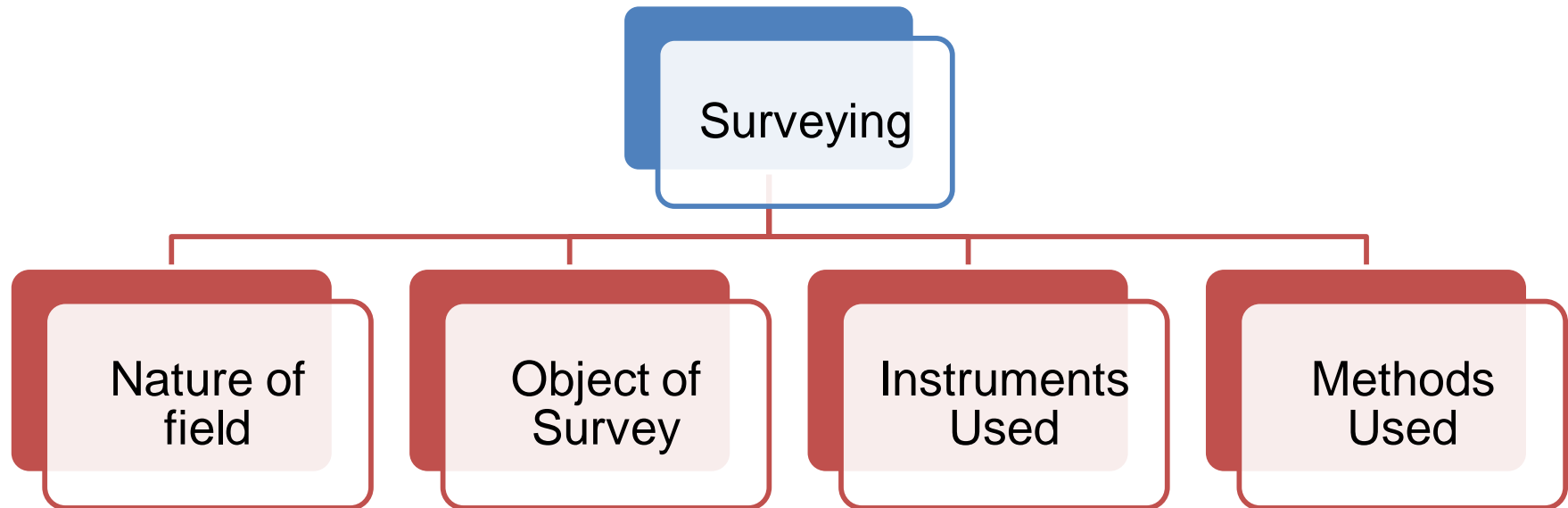
Purpose of Surveying:



1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

Classification of Surveying

Surveys may be secondarily classified under no. of headings which define the uses or purpose of resulting maps.



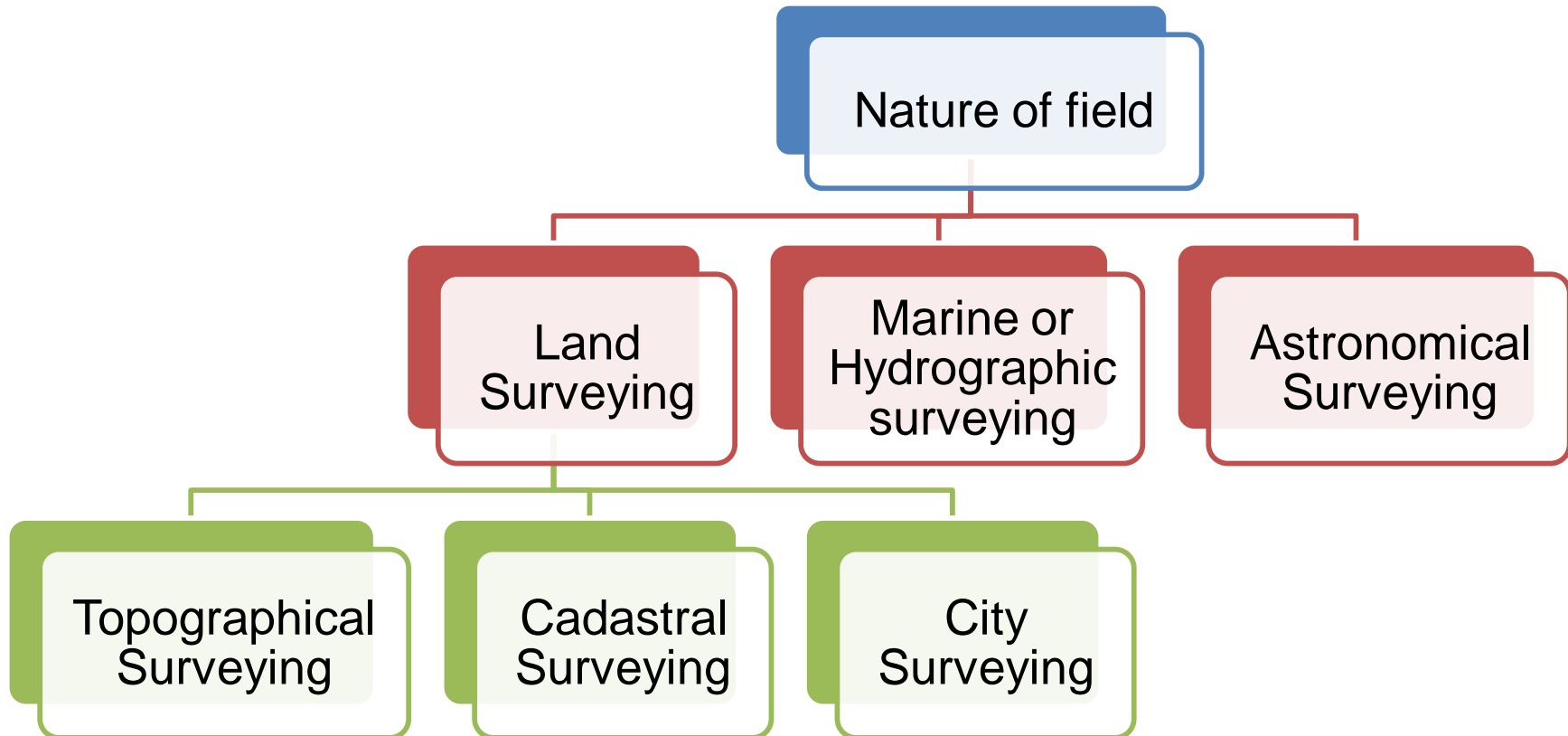
Video Reference:

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1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

a) Classification based on nature of field:

There are three types of surveying based upon the nature of field which are as follows,



1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

Land Surveying:

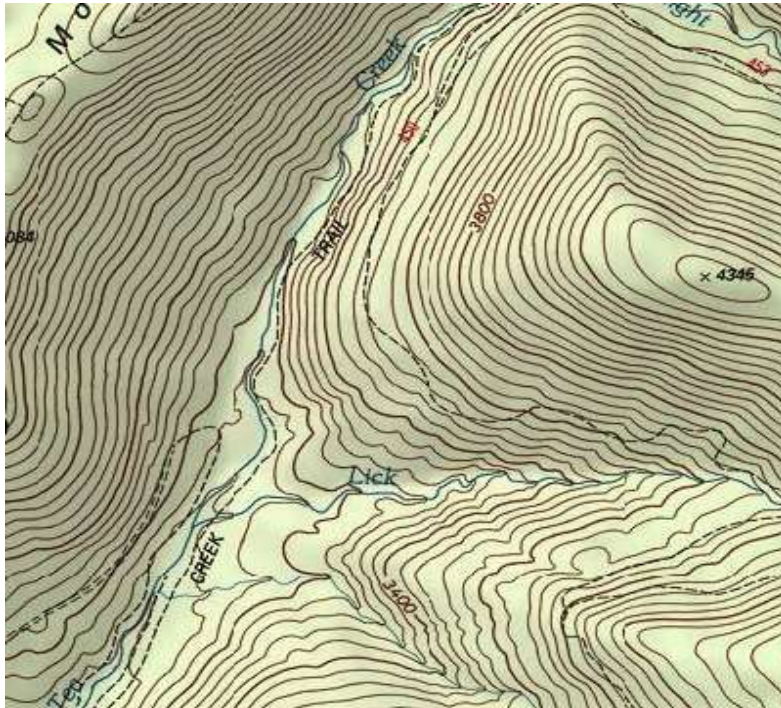
It generally deals with natural or artificial features on land such as rivers, streams, lakes, wood, hills, roads, railways, canals, towns, water supply systems, buildings & properties etc. It can be further classified as,

- i) Topographical survey
- ii) Cadastral Survey
- iii) City Survey

1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

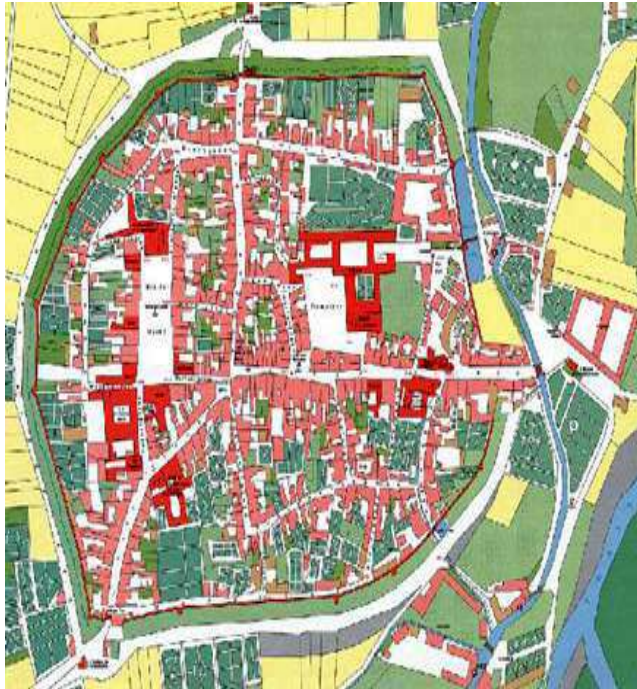
i) Topographical Surveying:

Natural features of country such as rivers, streams, lakes, woods, hills etc., and such artificial features as roads, railways, canals, towns and villages



1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

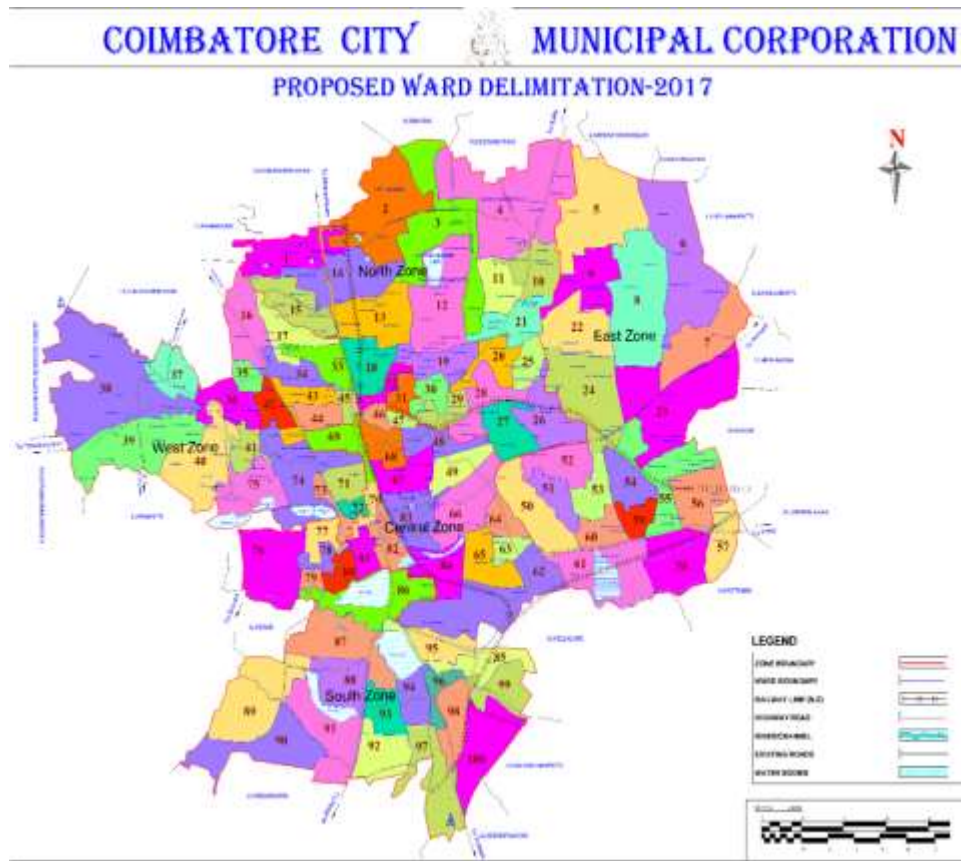
ii) Cadastral Surveying:



- Fixing of property lines, the calculation of land area, or the transfer of land property from one owner to another.
- Fix the boundaries of municipalities, State & Federal jurisdictions

1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

iii) City Surveying:

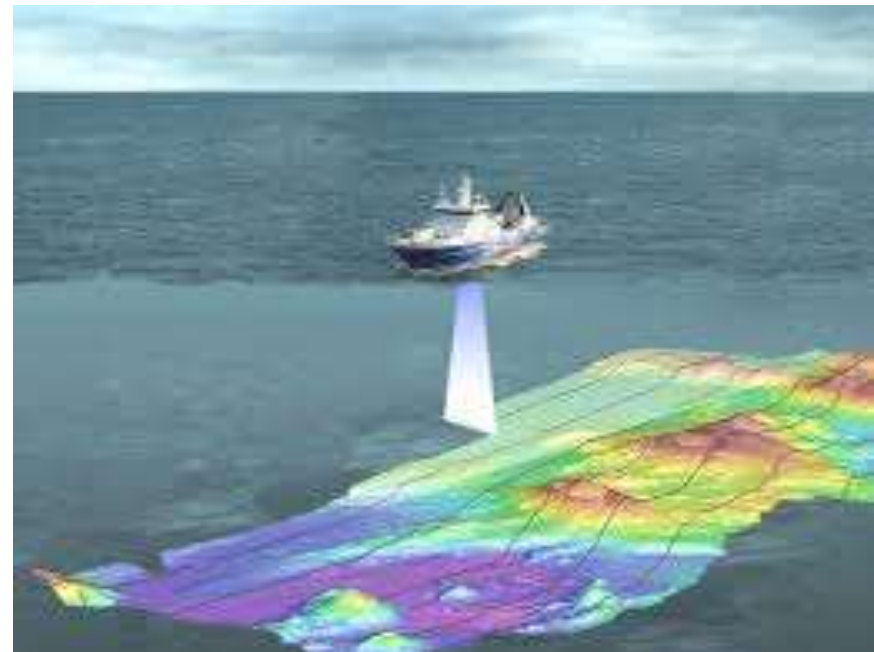
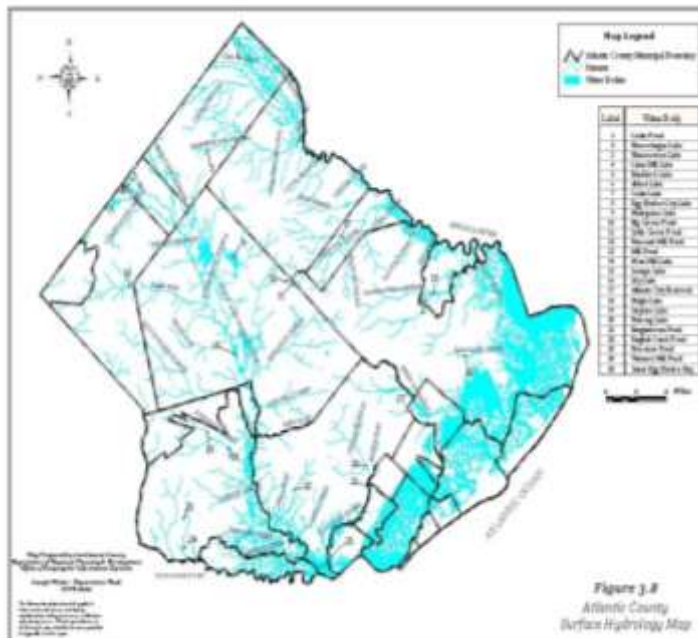


This survey made in connection with the construction of streets, water supply systems, sewer and other works

1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

Marine or Hydrographical Surveying:

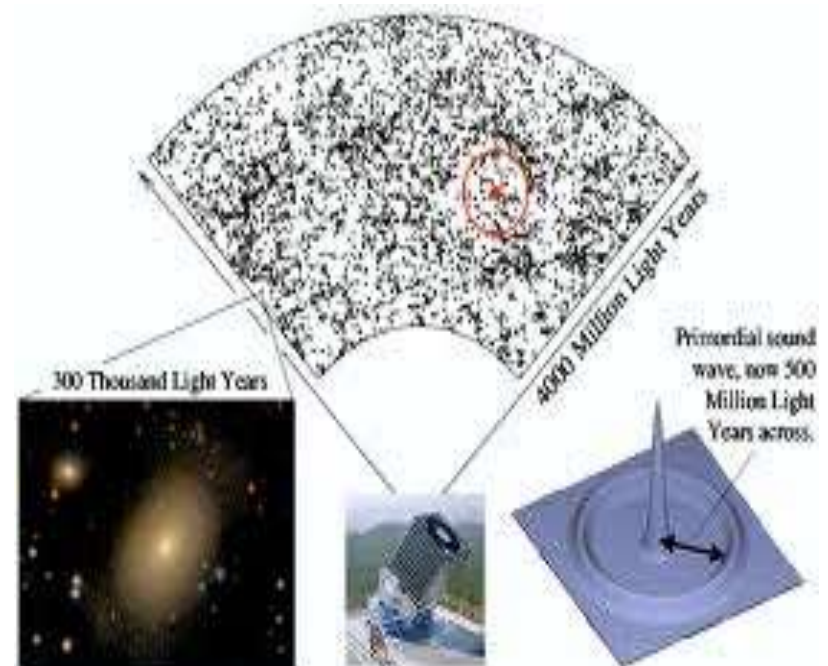
Marine or hydrographic survey deals with bodies of water for purpose of navigation, water supply, harbour works or for determination of mean sea level.



1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

Astronomical Surveying:

This survey is conducted for the determining of **latitudes**, **longitudes**, **azimuths**, **local time**, etc. for various places on earth by observing heavenly bodies (sun or the stars)



1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

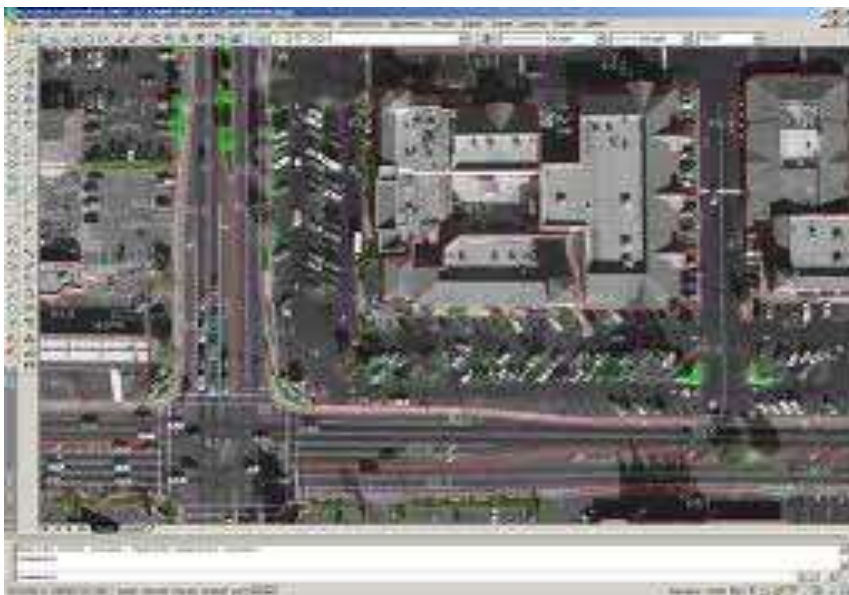
b) Classification based on object of survey:

Based on object there are five types of surveying which are as follows,

- Engineering Survey
- Military Survey
- Mine Survey
- Geological Survey
- Archaeological Survey

1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

ii) Military Survey:



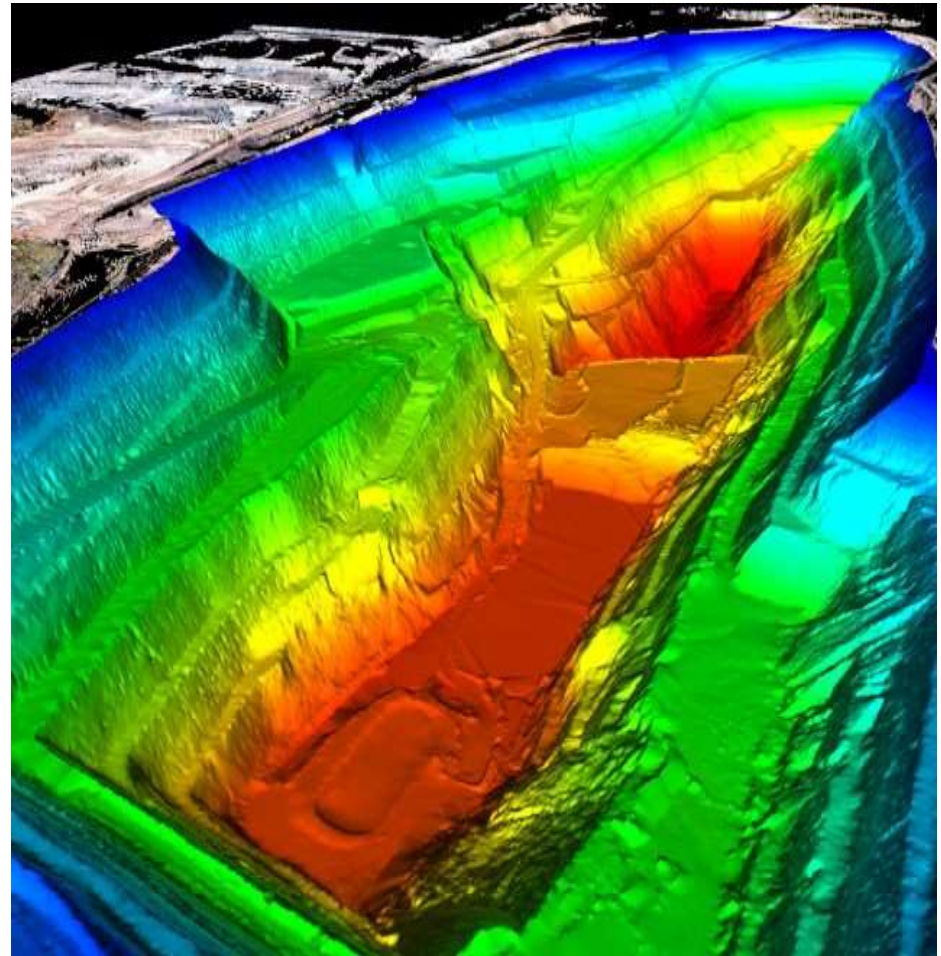
SIZE	SYMBOLS	MISC. SYMBOLS
•	Squad	■ Command Post
••	Section	▲ Observation Post
•••	Platoon	⚡ Boundary (battalion)
I	Company or Battery	⊕ Aid Station (battalion)
II	Battalion or Squadron	
III	Regiment or Air Group	
X	Brigade	
XX	Division or Wing	
UNIT SYMBOLS		EXAMPLES
■	Basic Unit	1L ■ 1DB 1st Sec. I. Bty, 1st Def Bn.
∞	Air	B ⊗ 5 Co B, 5th Mar Regt
LVT	Amphibian Tractor	⊗ 1Rdr 1st Rdr Bn
▲	Antiaircraft	⊗ 11 11th Mar Regt
●	DB Defense Battalion	⊗ 2 7 OP 2d Bn, 7th Mar Regt
E	Engineer	⊗ 1 CP, 1st Mar Div
●	Field Artillery	
⊗	Infantry	
⊗ Para	Parachute	
⊗ Prcht	Prcht	
P	Pioneer	
⊗ Rdr	Raider	
⊗	Tank	

Determining the points of strategic importance

1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

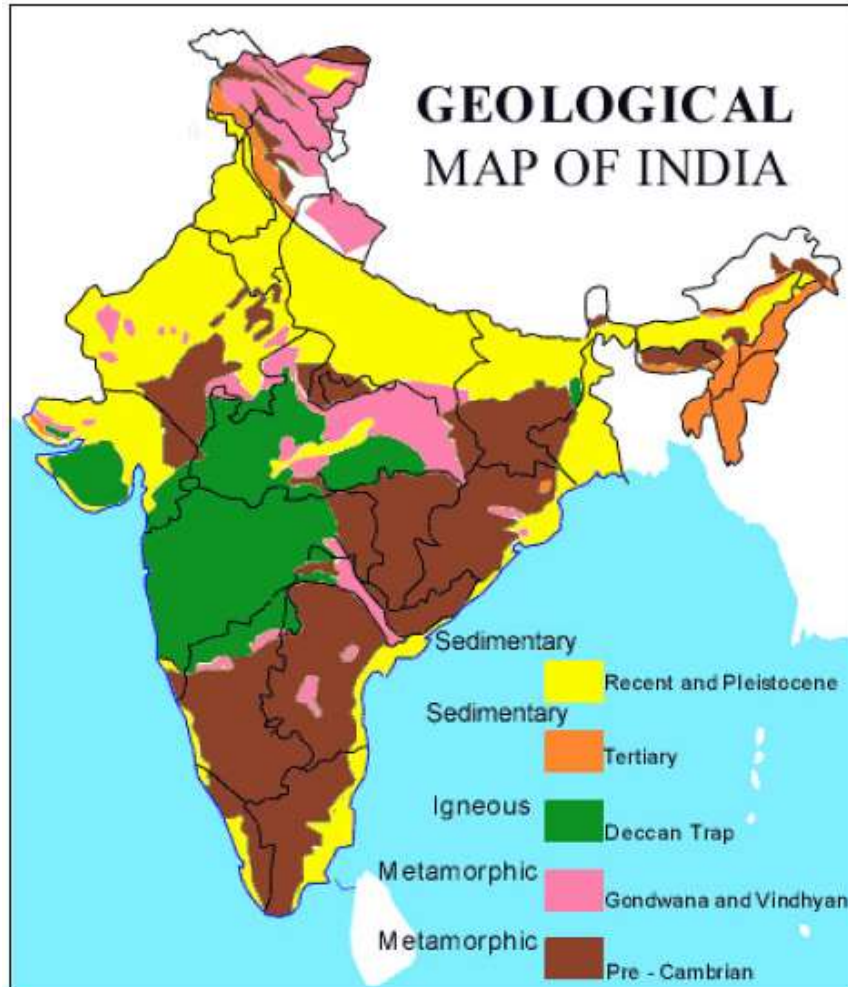
iii) Mine Survey:

Making underground survey for mining works, construction of **underground plans, tunnels** and preparation of **geological maps**



1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

iv) Geological Survey:



Used for determining different strata in the earth's crust

- Type of rocks
- Economic minerals
- Oils

1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

v) Archaeological Survey:



It is conducted to locate relics of antiquity, civilization, kingdoms, forts, temples, etc.,

1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

c) Classification based on instruments used:

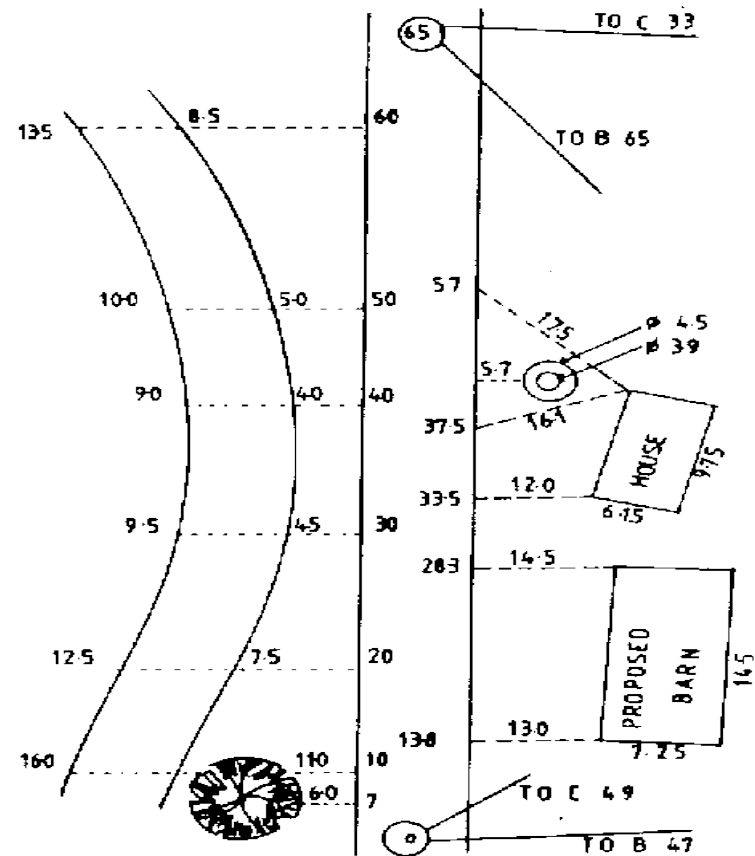
Based on object there are eight types of surveying which are as follows,

- Chain and Compass Survey
- Theodolite Survey
- Tacheometric Survey
- Levelling Survey
- Plane table Survey
- Photogrammetric or Aerial Survey
- Electronic Distance Measurements (EDM)

1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

i) Chain Survey:

Chain surveying is the simplest type of surveying in which only linear measurements are made with a chain or a tape. Angular measurements are not taken.



1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

ii) Compass Survey:

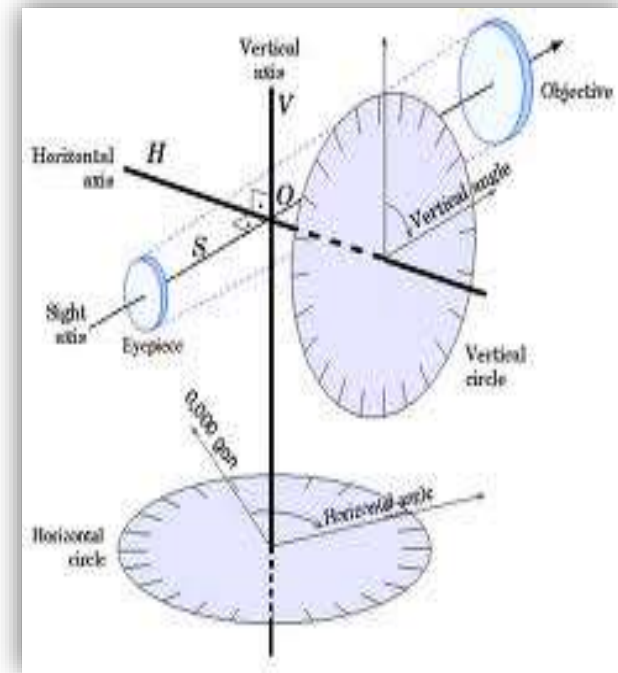
In Compass Survey, the angles are measured with the help of a magnetic compass.



1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

iii) Theodolite Survey:

In theodolite survey the **horizontal angles** are measured with the theodolite more precisely than compass and the linear measurements are made with a chain or tape.



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iv) Tacheometric Survey:

A special type of theodolite known as tachometer is used to determine **horizontal and vertical** distances indirectly.



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v) Leveling Survey:

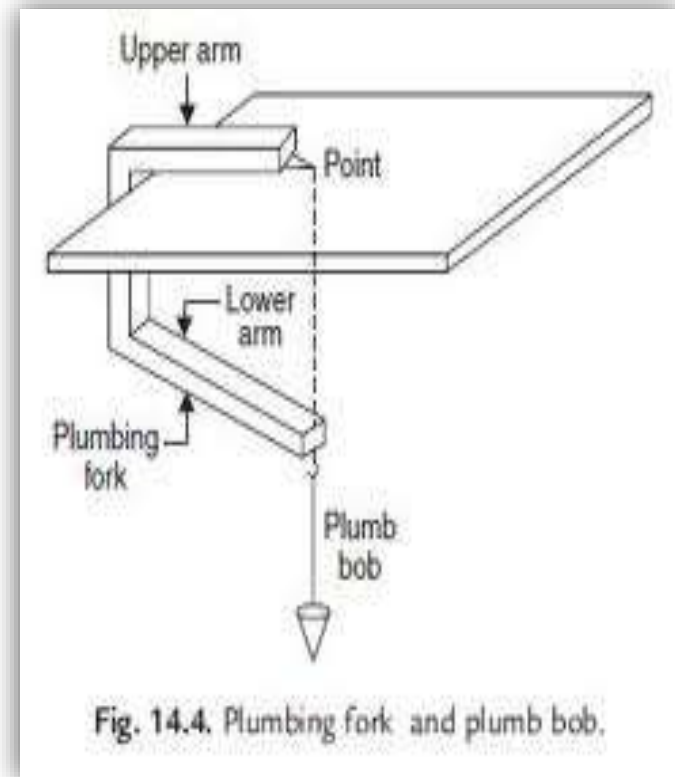
This type of survey is used to determine the vertical distances (elevations) and relative heights of points with the help of an instrument known as level.



1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

vi) Plane Table Survey:

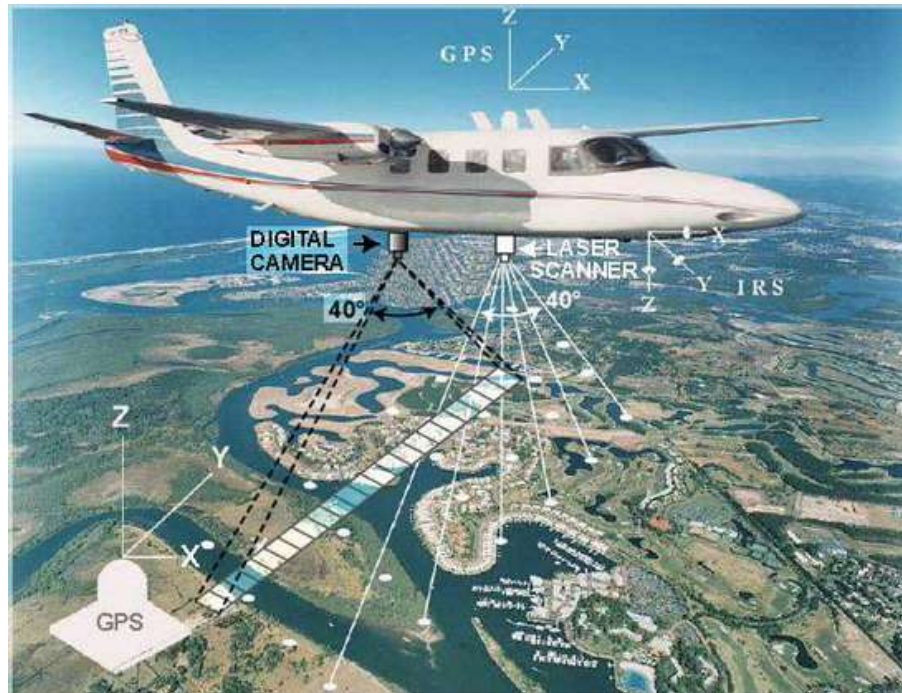
Plane Table is a [graphical method of surveying](#) in which field works and plotting both are done simultaneously.



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vii) Photogrammetric or Aerial Survey :

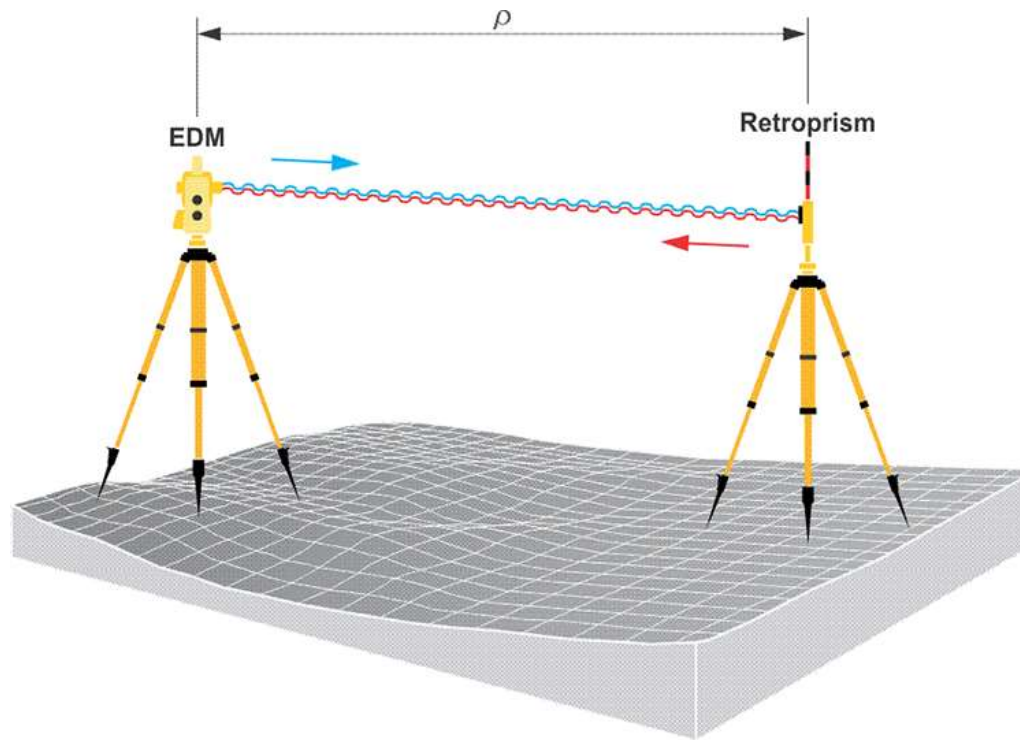
Photogrammetry is the science of taking measurements with the help of **photographs taken by aerial camera** from the air craft. This is also known as Aerial survey.



1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

viii) EDM Survey:

In this type of survey all measurements (length, angles, coordinates) are made with the help of EDM instrument (i.e.. Total Station).



1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

d) Classification based on method of survey:

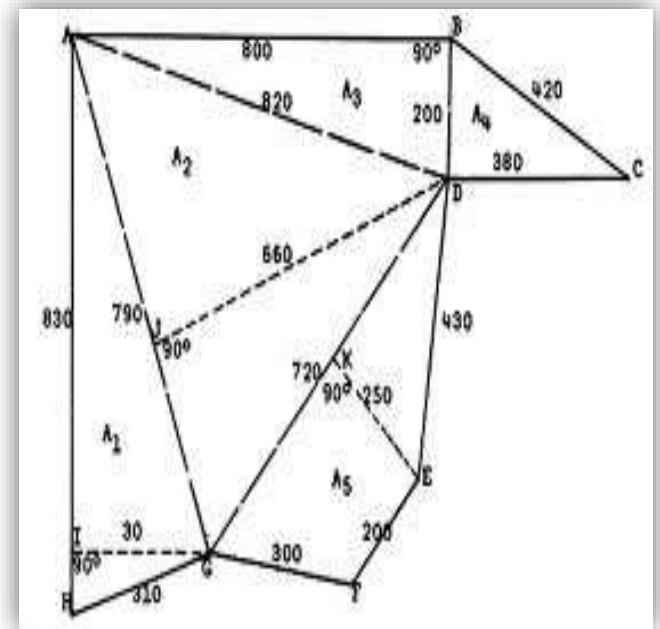
Based on methods there are two types of surveying which are as follows,

Triangulation method

Triangulation is basic method of surveying. The entire area is divided into network of triangles.

Traversing

A Traversing is circuit of survey lines. It may be open or closed. The directions or horizontal angles are measured with a compass or a theodolite respectively the survey is called traversing.



1.2 EQUIPMENT AND ACCESSORIES FOR RANGING AND CHAINING, SURVEY STATION, SURVEY LINES

1.2.1 Equipment and accessories for chaining

Chain Surveying:

It is the branch of surveying in which the distances are measured with a chain and tape and the operation is called chaining.

Instruments used for chaining:

- Chain or tapes
- Arrows
- Pegs
- Ranging rods
- Plumb bob



Video Reference:

<https://drive.google.com/file/d/1142Mi6e5u8he0LOQBeX9axYqkXC-mnK2/view>

1.2 EQUIPMENT AND ACCESSORIES FOR RANGING AND CHAINING, SURVEY STATION, SURVEY LINES

1.2.2 Equipment and accessories for ranging

The ranging equipment is generally used to mark the points in a required area and **to set out a straight line** on the field

- Chain or tapes
- Arrows
- Pegs
- Ranging rods
- Plumb bob
- **Cross staff**



Video Reference:

https://drive.google.com/file/d/1K5L1jHQe1YzEm9Qg-X4xbXbVZ_iqwDGg/view

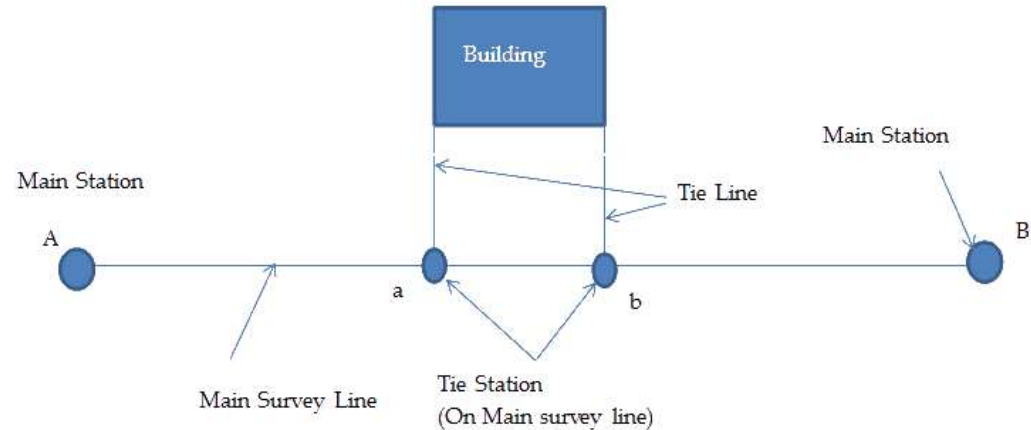
1.2 EQUIPMENT AND ACCESSORIES FOR RANGING AND CHAINING, SURVEY STATION, SURVEY LINES

1.2.3 Survey stations

Survey stations are the points at the beginning and at the end of a chain line they may also occur at any convenient position on the chain line.

Such station may be

- Main Stations
- Subsidiary Stations
- Tie Stations



The principle of chain surveying is to divide the area into a number of triangles of suitable sides.

Video Reference:

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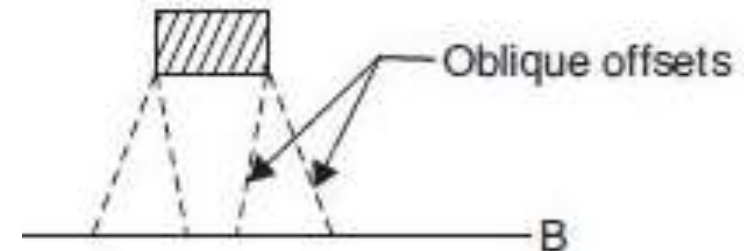
1.2 EQUIPMENT AND ACCESSORIES FOR RANGING AND CHAINING, SURVEY STATION, SURVEY LINES

1.2.5 Offset

Lateral measurements taken from an object to chain lines for locating ground features are known as offsets.

Types of Offset :

- Perpendicular offset :
Perpendicular to the chain line
- Oblique offset:
Angle deviation to the chain line



Video Reference:

<https://drive.google.com/file/d/1j9xi4Gbn84fYwpF5liqBYxo45UpdWEb5/view>

1.2 EQUIPMENT AND ACCESSORIES FOR RANGING AND CHAINING, SURVEY STATION, SURVEY LINES

Test your Knowledge:

1. Instruments used on chain surveying
2. How to determination of measurements in chain surveying?
3. Types of survey stations and lines
4. Concept of offset
5. Plotting the chain surveying by stations and lines

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1.1 – CLASSIFICATIONS AND BASIC PRINCIPLES OF SURVEYING

Test your Knowledge:

1. Basic concept of surveying.
2. Primary divisions of surveying
3. Different types of surveying
4. Major principles of surveying

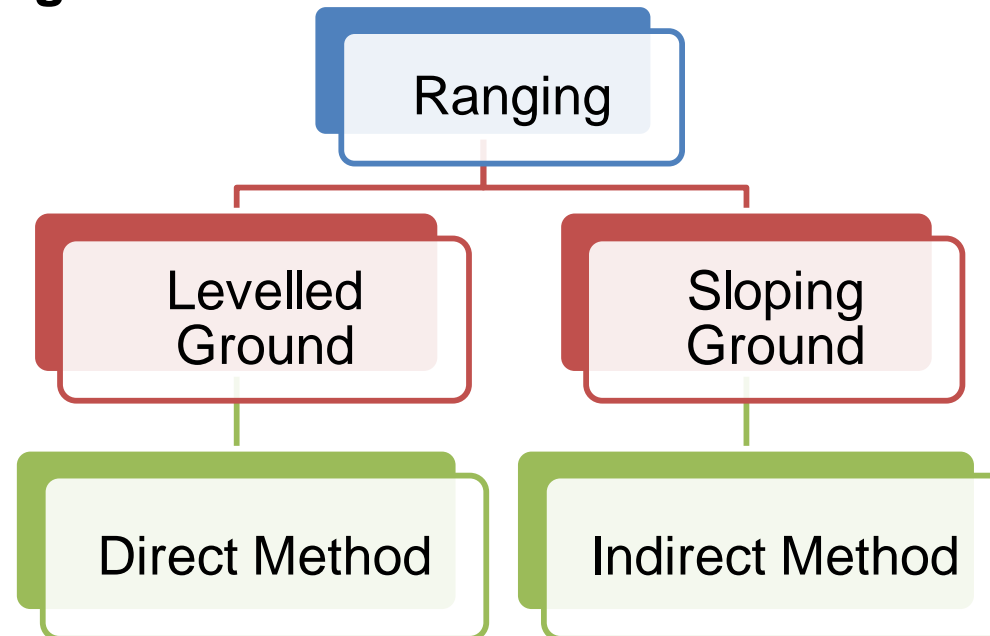
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1.3 METHODS OF RANGING

1.3 Ranging:

The process of establishing intermediate points on a straight line between two end points is known as ranging. Ranging must be done before a survey line is chained

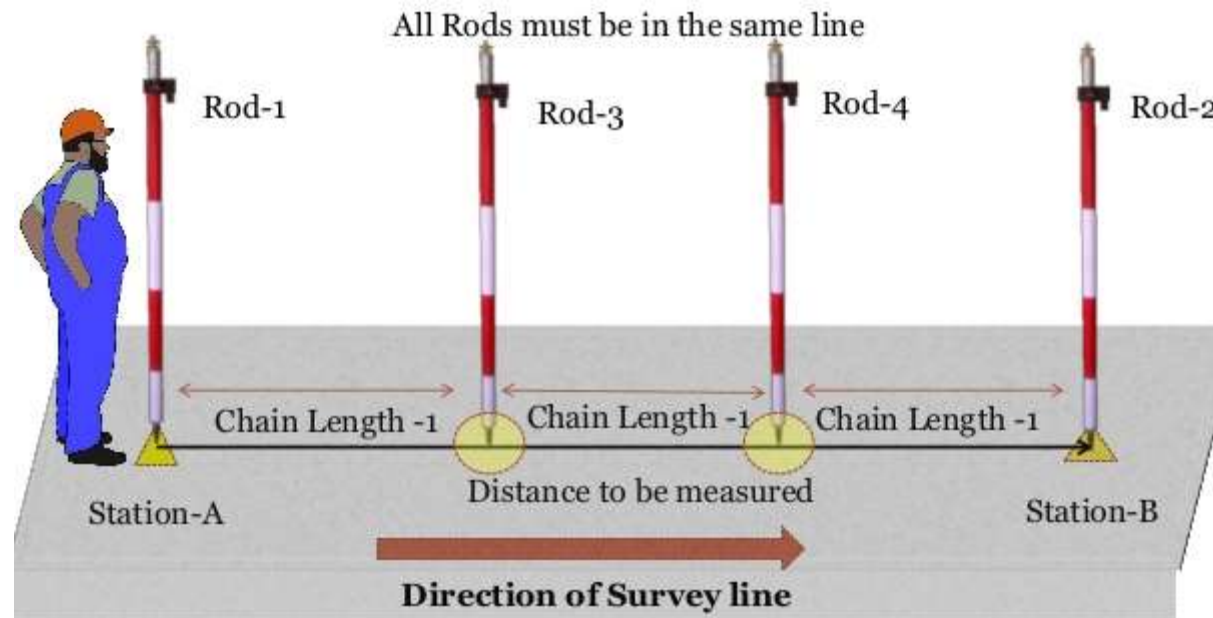
Methods of ranging:



1.3 METHODS OF RANGING

1.3.1 Direct ranging method - Levelled ground

If the first and last points are inter visible this method is possible.



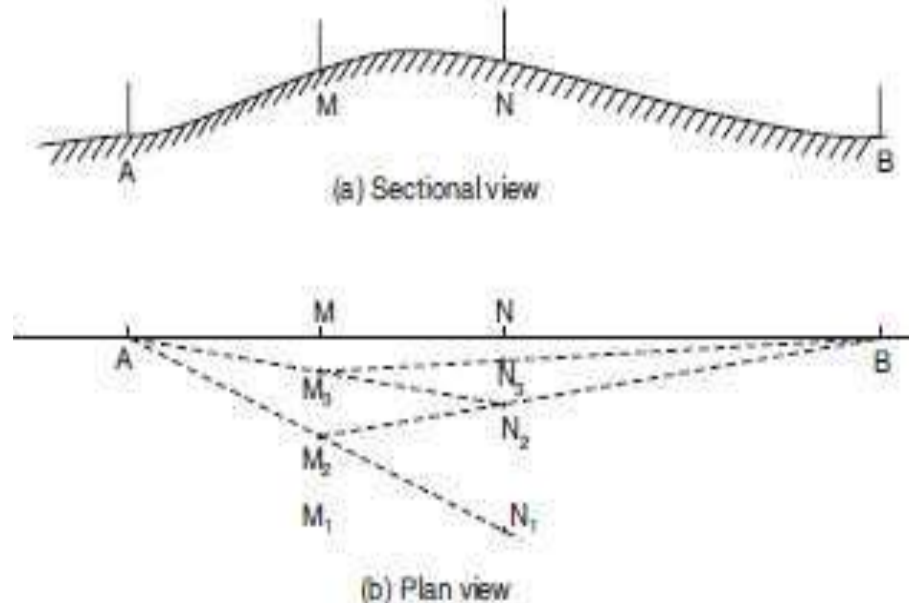
Video Reference:

<https://drive.google.com/file/d/1DGpDPnmTsh7S0mHFv87suCeI2Qusxjdx/view>

1.3 METHODS OF RANGING

1.3.2 Indirect ranging method – Sloping ground

Due to intervening ground, if the ranging rod at B is not visible from station A, reciprocal ranging may be resorted. Figure shows this scheme of ranging.



Video Reference:

https://drive.google.com/file/d/10A8mkuPcHz3LftITCcGLs65vEa8N_LsxS/view

1.3 METHODS OF RANGING

Test your Knowledge:

1. Different methods of ranging
2. How you select appropriate surveying method according to site conditions?
3. How you record the measurements in field book?

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1.5 COMPASS SURVEYING – BASIC PRINCIPLES AND TYPES

1.5.1 Introduction and Principles of Compass surveying

Compass surveying:

Compass surveying is a type of surveying in which the **directions of surveying lines** are determined with a magnetic compass, and the length of the surveying lines are measured with tape or chain or laser range finder.



Purpose of Compass surveying:

Compass surveying is suitable in the following situations:

- When the survey work to be completed quickly
- When the area is hilly and chaining is difficult
- When the area to be surveyed is relatively large
- When the details are too many
- When the area can not be divided into network of triangular
- When the area to be surveyed is long and narrow i.e. road, stream etc.,
- When the survey is to be done through dense forest

Principle of Compass surveying:

- The directions of survey lines are fixed by angular measurements and not by forming a network of triangular
- Magnetic bearing of the series of connected lines are measured by prismatic compass
- Not recommended for areas where local attraction

Video Reference:

https://drive.google.com/file/d/1gCMmj5A_86eihM5iG0JcmyP8FAg4Spvz/view

1.5.2 Types of compass surveying

The compass can not measure the angle between two line directly but can measure angle of a line with reference to magnetic meridian at the instrument station point is called **magnetic bearing** of a line. The angle between two lines is then calculated by getting bearing of these two lines.

Types of compass:

- Prismatic compass
- Surveyor's compass

Video Reference:

<https://drive.google.com/file/d/1FYIE4L5sJVckhPPa1Oj0pocR1hZ2vKAR/view>

1.5 COMPASS SURVEYING – BASIC PRINCIPLES AND TYPES

Difference between Prismatic and Surveyor's compass

Prismatic compass	Surveyor's compass
Graduation circle is fixed to broad type needle. Hence, it will not rotate with the line of sight	Graduation circle is fixed to the box. Hence, it rotates with the line of sight
There is a prism at viewing end	At viewing end there is no prism. There is only a slit.
Sighting and reading can be done simultaneously.	Sighting and viewing cannot be done simultaneously.
The graduations are in whole circle bearing	The graduations are in quadrantal system.
Graduations are marked inverted since its reflection is read through prism	Graduations are marked directly. They are not inverted
The reading is taken through a prism	The reading is taken by directly viewing from top glass

Test your Knowledge:

1. What is the basic concept of compass surveying?
2. The difference between prismatic and surveyor's compass
3. The principle of compass surveying