MODERN SURVEYING INSTRUMENTS

Introduction

- Conventional surveying
  - linear measurements
    - chain and tape
  - angular measurements
    - compass and ordinary theodolites
  - Levelling work
    - Dumpy level and a levelling staff
  - Survey work becomes slow and tedious

DISTOMAT

- **Electronic equipment**
  - **coming under the category of electronic distance meter (EDM)**
  - **used for the easy measurement of distances**

DISTOMAT (Contd.)

- **Working**
  - Designed to fit on the telescope of an electronic theodolite
  - For measuring the distance between two points
    - Instrument is set up at one point
    - A reflector is set up at the other as a target
      - Reflector includes a pole with a prism

DISTOMAT (Contd.)

- **Working (Contd.)**
  - **Principle**
    - Distomat transmits an infrared beam which is reflected back to the unit by the reflector
    - Distomat records the time taken by the ray to come back to the receiving end.
    - With this, the distance taken for the travel by the ray is calculated automatically and displayed.

Total station

- **Also called as**
  - **Electronic Tacheometer**
  - **Field Station**

Total station (Contd.)

- **Concept of Total Station**
  - **Got its name because**
    - Equipment can be used to perform all surveying operations in a single set up from a station (or point)
    - Can electronically measure both angles and distances
    - An electronic theodolite (transit) integrated with an electronic distance meter (EDM)

Total station (Contd.)

- **Concept of Total Station (Contd.)**

  - **Two basic designs**

    - **Integrated design**
      - both the electronic theodolite and the EDM are assembled in a single unit

    - **Modular design**
      - both the electronic theodolite and the EDM act as separate units.

Total station (Contd.)

- **Concept of Total Station (Contd.)**
  - **Data recorder (collector)**
    - A hand-held computer
    - containing
      - an alphanumeric keyboard + LCD display
    - Works with the help of a rechargeable compact battery
    - Records all the measurements in suitable format
    - Performs some basic computations such as figure closures and adjustments

Total station (Contd.)

- **Concept of Total Station (Contd.)**
  - **Inbuilt automatic atmospheric sensor**
    - **Measures the atmospheric pressure and temperature in real time**
    - **Applies the required corrections in measurements automatically**

Total station (Contd.)

- **Working of Total Station**
  - Measurement of coordinates
  - Measurement of angles
  - Measurement of distance

Total station (Contd.)

- **Working of Total Station (Contd.)**

  - **Entry of Initial Data**

    - **Equipment switched on**

    - **Some initial data fed into it before starting the work**
      - **Description of the project, date of survey, details of survey team, choice of measurement units etc.**

Total station (Contd.)

- **Working of Total Station (Contd.)**
  - **Entry of traverse station (Occupied point) and feature (Sighted Point) code**
    - **A suitable coding system given for stations for their recognition at a later stage**
    - **Traverse station**
      - **Additional data such as height of instrument, station name and number, coordinates of traverse station also entered**
    - **Sighted point**
      - **Additional data like height of reflector, point name and number etc. also noted**

Total station (Contd.)

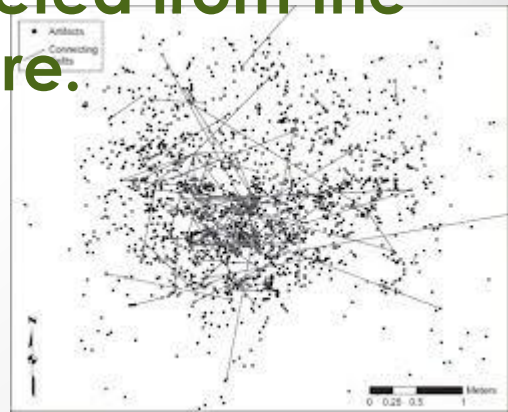
Working of Total Station (Contd.)

- Transfer of data and its processing

  - Total station supplied with software
    - for processing the data stored in the data collector
    - First the data have to be downloaded from the electronic field book to a computer where the software is installed
    - Field book directly connected to the computer through a cable / memory card reader

Total station (Contd.)

- **Working of Total Station (Contd.)**
  - **Plotting of Details**
    - After processing the field data in the desired form (i.e., the coordinates),
    - Data required for plotting may be assembled
    - Survey can be quickly plotted at any scale on a printer or a plotter
    - Symbols necessary for plotting different topographical features can be extracted from the symbol library provided in the software.



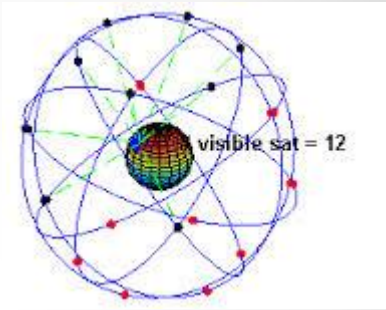
Total station (Contd.)

- **Advantages of total station**
  1. Digital read out of distances and angles make the instrument too user friendly.
  2. The instrument can be very quickly and easily set up on the tripod.
  3. Graphical view is available for easy visualization of surveyed plot.
  4. The integrated calculator helps with trigonometric functions in the computation of area of plot, hence making the process easy and accurate.

Total station (Contd.)

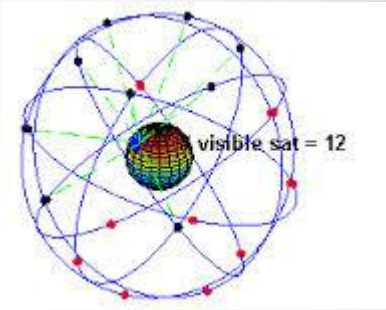
- **Advantages of total station (Contd.)**
  5. Plotting is quick after the data transfer.
  6. Plotting and area computation is possible at any scale desired by the user.
  7. The data recorder in the total station completely eliminates the need for a person to record the data.
  8. The instrument does not need accurate levelling due to the presence of an automatic compactor for incorrect levelling.

GLOBAL POSITIONING SYSTEM (GPS)



- emerging technology
- Main advantage
  - economy in operation and time

GLOBAL POSITIONING SYSTEM (GPS) (Contd.)



- **Working of GPS**

- **Main advantage**
  - **economy in operation and time**