

CE 103: SURVEYING

LECTURE 18: MODERN EQUIPMENT OF SURVEYING

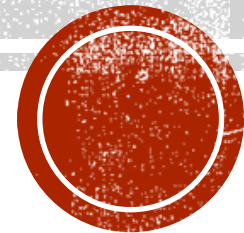
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OUTLINE

Modern equipments

- EDM – Electronic distance measurement eqp.
- Auto level.
- Digital level.
- Total station.
- GPS – global positioning system.

EDM

- Now separate EDM are not very popular , instead Total Station which have in built EDM is being used .
- Measurement of distance is accomplished with a modulated microwave or infrared carrier signal, generated by a small solid-state emitter within the instrument's optical path, and bounced off of the object to be measured. The modulation pattern in the returning signal is read and interpreted by the onboard computer in the EDM. The distance is determined by emitting and receiving multiple frequencies, and determining the integer number of wavelengths to the target for each frequency.

Most total stations use a purpose-built glass Porro prism as the reflector for the EDM signal, and can measure distances out to a few kilometers, but some instruments are "reflectorless", and can measure distances to any object that is reasonably light in color, out to a few hundred meters. The typical Total Station EDM can measure distances accurate to about 3 millimeters or 1/100th of a foot.

Hand held EDM

- Very handy,
- Cheap,
- Can be used with accuracy of 10mm or so,
- Useful for remote measurements like contact wire etc.,



Early age levels

- Early age levels are
 - Dumpy levels.
 - Tilting levels.



AUTO LEVEL

- Now most commonly used levelling instruments are - Auto level.
 - Auto level, as name sounds it has a auto level compensator and corrects automatically if instrument goes out of level within it's range.



- With auto level:-
 - Survey work can be done fast,
 - Less chances of error,
 - Magnification available is more,
 - Range is more,
 - Image is erect so less chances of error.

Digital level

- They are not popular instead auto levels are more extensively used.
- The Trimble DiNi Digital Level : Determine accurate height information 60% faster than with automatic leveling
- Eliminate errors and reduce rework with digital readings
- Transfer data to the office easily
- Measure to a field of just 30 cm



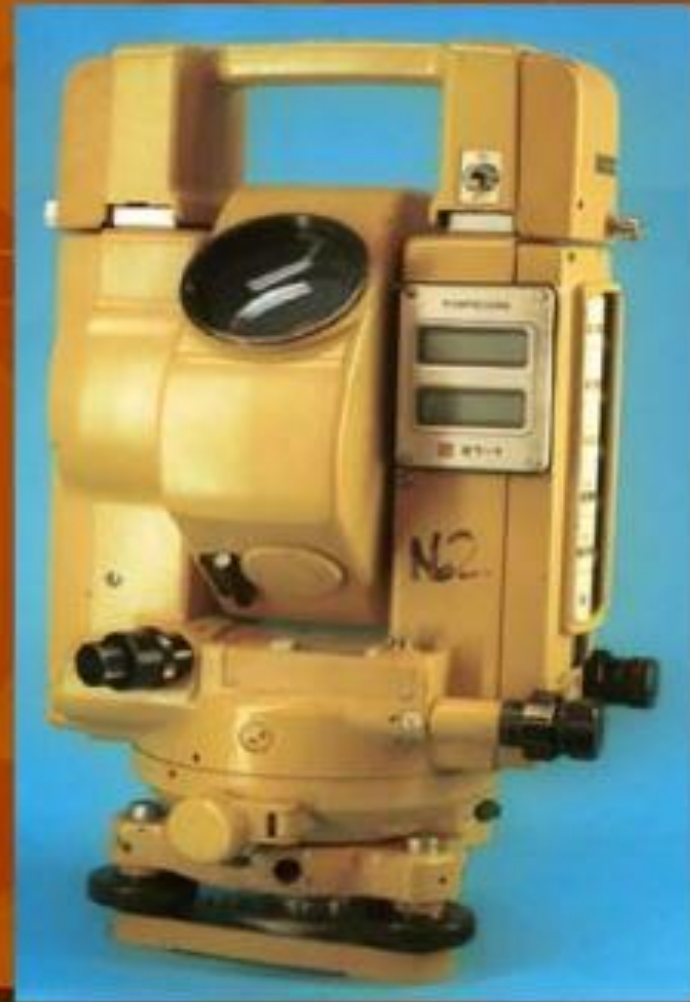
TOTAL STATION

- **Basic Principle**

A total station integrates the functions of a theodolite for measuring angles, an EDM for measuring distances, digital data and a data recorder. Examples of total stations are the Sokkia Set4C and the Geodimeter 400 series. All total stations have similar constructional features regardless of their age or level of technology, and all perform basically the same functions.

Features:-

- Total solution for surveying work,
- Most accurate and user friendly,
- Gives position of a point (x, y and z) w. r. t. known point (base point),
- EDM is fitted inside the telescope,
- Digital display,



- On board memory to store data,
- Compatibility with computers,
- Measures distance and angles and displays coordinates,
- Auto level compensator is available,
- Can work in lesser visibility also,
- Can measure distances even without prismatic target for lesser distances,
- Is water proof,
- On board software are available,
- Can be used for curve layout after feeding data.

- New **total stations** have atmospheric correction, and auto-focus. In addition, these series incorporates a quick distance measuring mode and a high data storage capacity for increased productivity.
- The new **Total station** gives the unique opportunity for long range distance monitoring of up to 9000m to a single prism. Using the scan functionality of software allows fully automated monitoring of the prism in direction of the line of sight.

USES:-

Total Stations can be used for:

- General purpose angle measurement
- General purpose distance measurement
- Provision of control surveys
- Contour and detail mapping
- Setting out and construction work

Factors influencing the use of Total Stations:

- A clear line of sight between the instrument and the measured points is essential.
- The precision of the instrument is dependent on the raw repeatabilities of the direction and distance measurements.
- A well defined measurement point or target/prism is required to obtain optimal precision and accuracy.
- The accuracy of direction and distance measurement is subject to a number of instrumental errors and the correct field procedures.

Auxiliary Equipment Required

- Targets or Prisms to accurately define the target point of a direction measurement.
- A data recorder if one is not integrated into the total station.
- A download cable and software on a PC to capture and process the captured digital data to produce contour and detail maps.

■ ROBOTIC TS

- Display at target also,
- No need of operator on station,
- Moves automatically to predetermined direction and focuses automatically at target at specified distance,
- Can be integrated with GPS also.

