MODULE 4

Leveling: Basic terms and definitions, Methods of leveling, Dumpy level, auto level, digital and laser levels. Curvature and refraction corrections.

Booking and reduction of levels. Differential leveling, profile leveling, fly leveling, check leveling, reciprocal leveling, trigonometric levelling (heights and distances-single plane and double plane methods.

Why do we perform leveling surveys?

- To determine the topography of sites for design projects
- Set grades and elevations for construction projects
- Compute volumes of earthwork

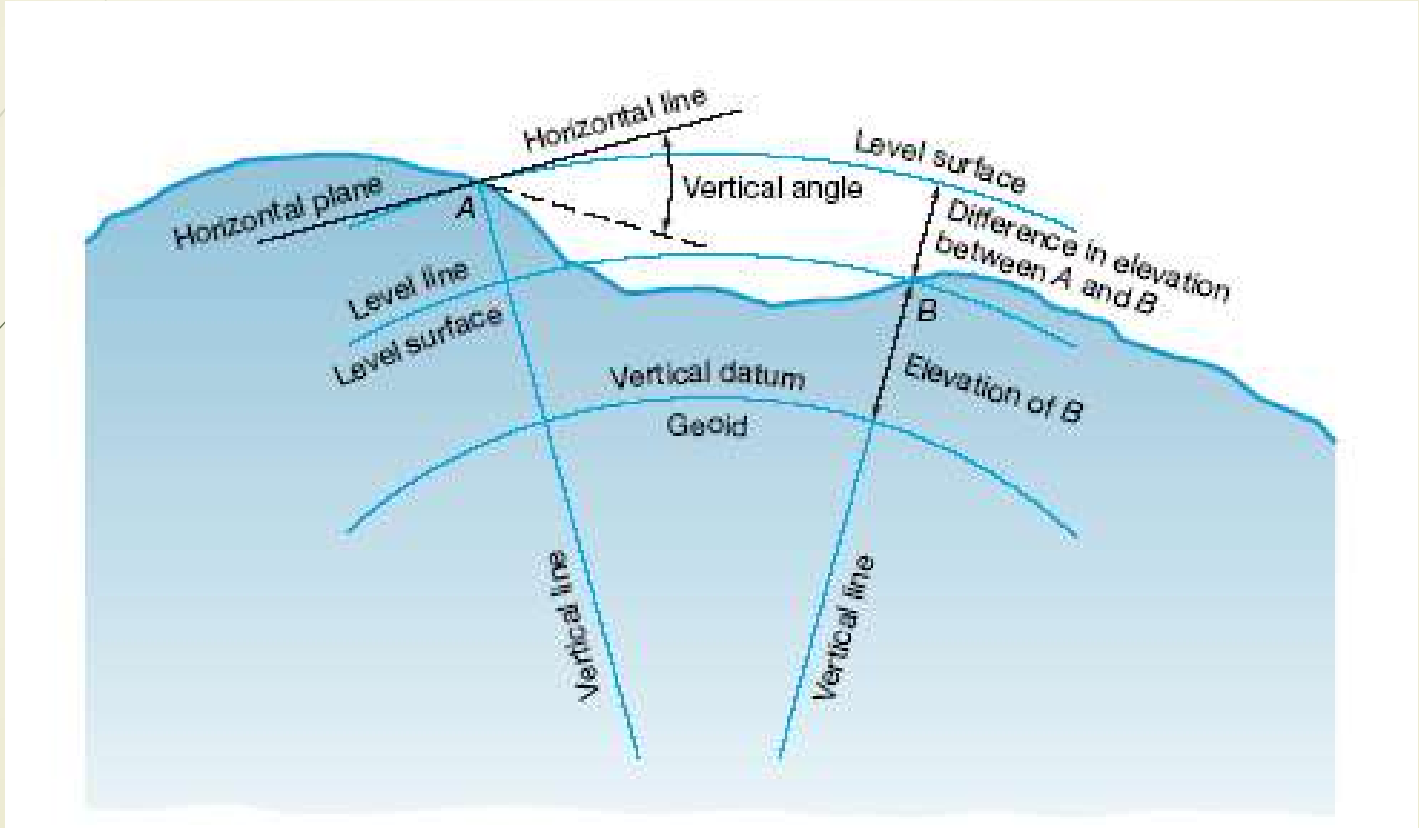
Principle of levelling

The principle of levelling is to obtain horizontal line of sight with respect to which vertical distances of the points above or below this line of sight are found.

OBJECTIVE OF LEVELLING

- ***Find the elevation of given point with respect to some assumed reference line called datum.***
- ***To establish point at required elevation with respect to datum.***

Leveling Terms



TERMS

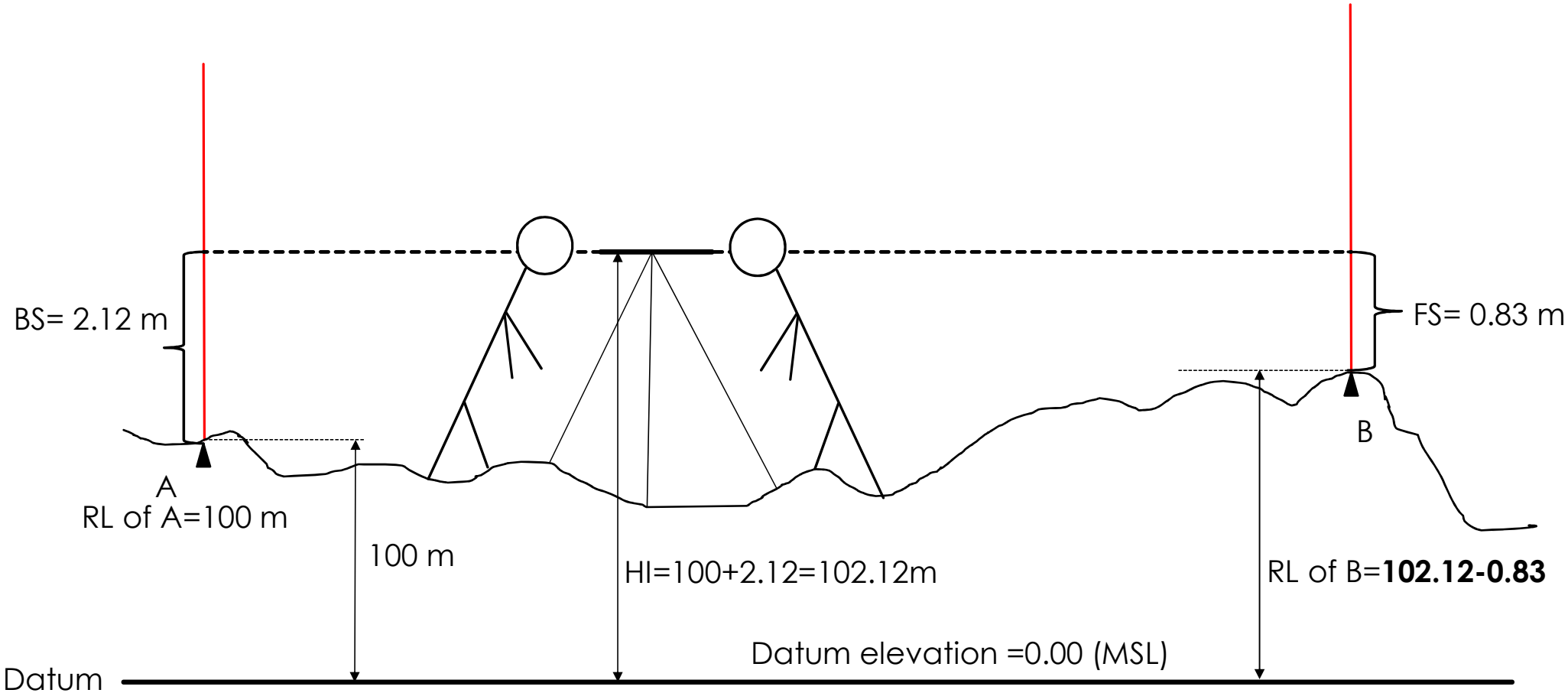
- *Level surface*
- *Level line*
- *Horizontal plane*
- *Horizontal line*

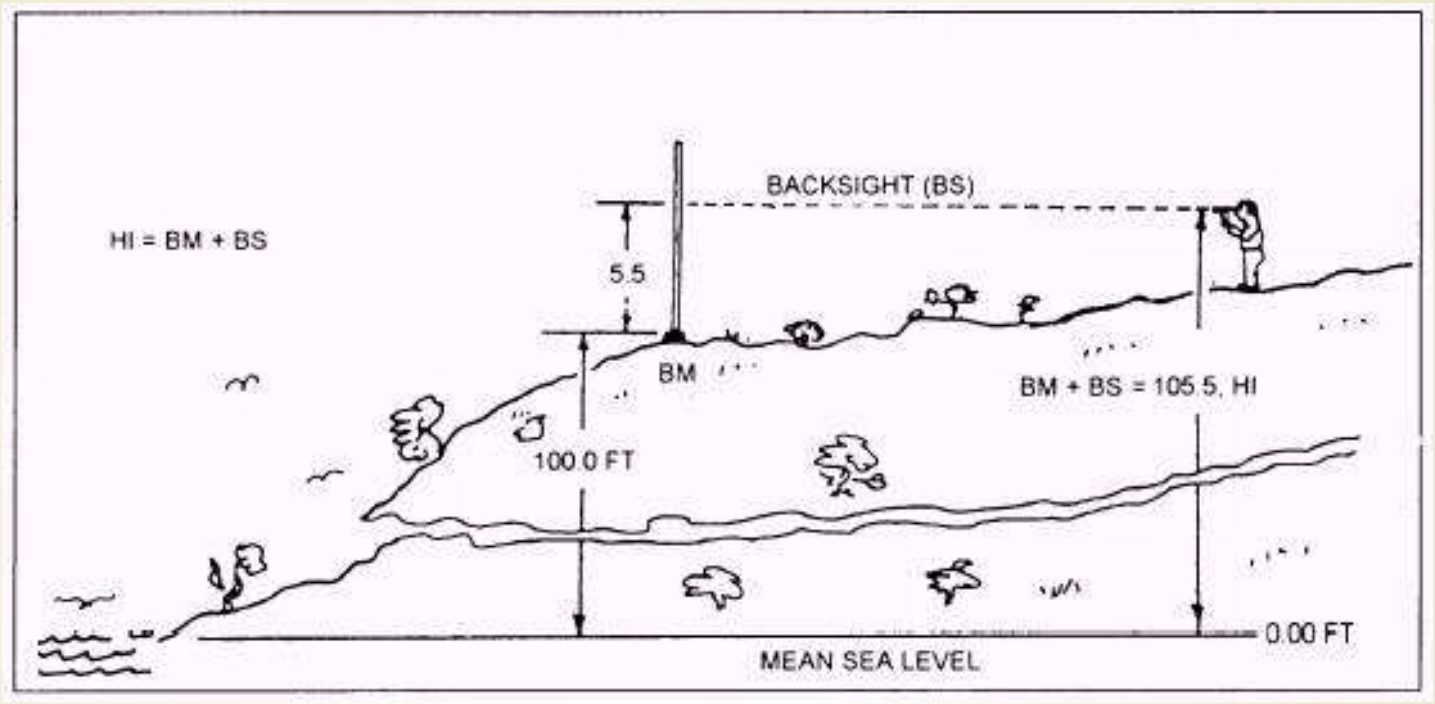
- **Datum**
  - It is an arbitrary level surface from which elevation of points may be referred". In India mean sea level is considered as datum of zero elevation
  - Mean sea level is the average height of sea for all stages of tides it is derived by averaging the hourly tide height over a period of 19 years.
- **Elevation or Reduced level**
  - It is height or depth of any point above or below any datum. It is denoted as R.L.

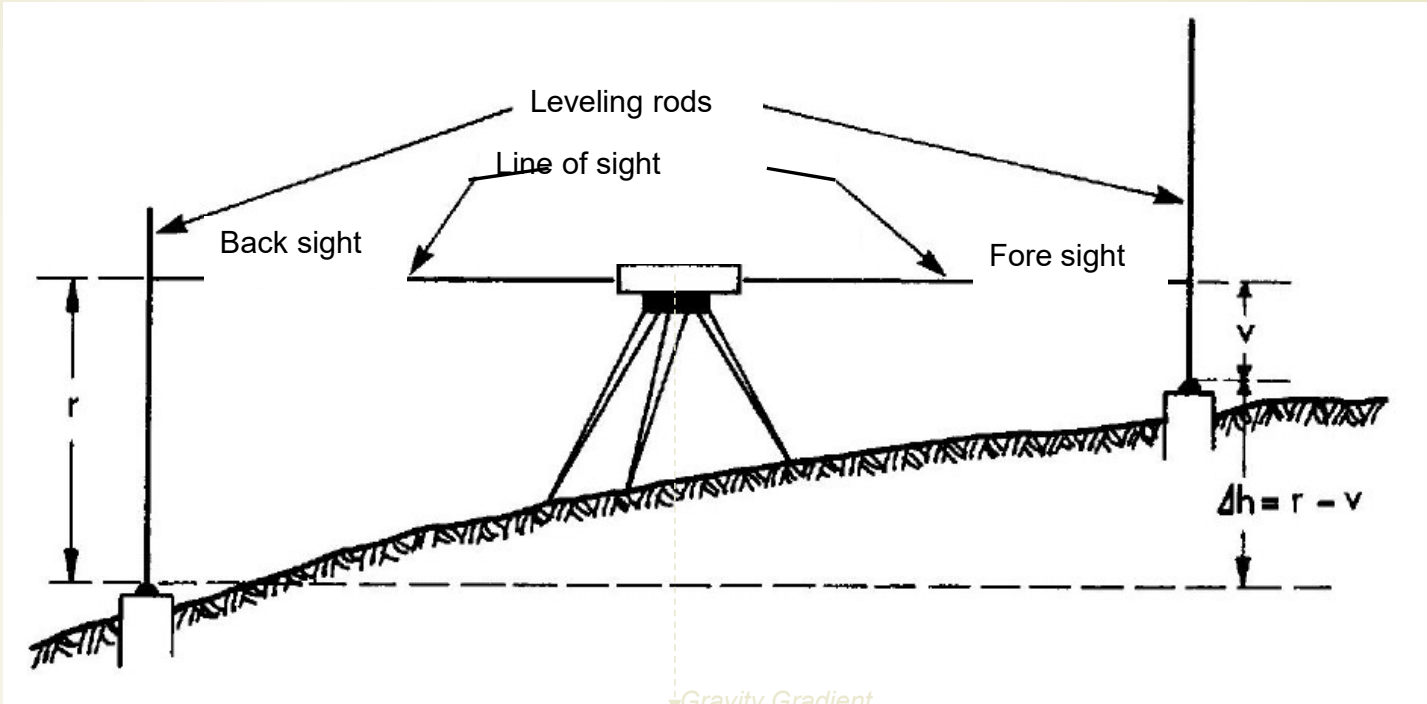
- **Bench Mark (B.M.)**
  - It is a fixed reference point of known elevation with respect to datum.
- **Line of collimation**
  - It is a line joining the intersection of cross hairs of diaphragm to the optical centre of object glass and its continuation. It is also known as **line of sight**.
- **Height of instrument**
  - It is the elevation of line of collimation with respect to datum
- **Back sight**
  - It is a staff reading taken at a known elevation. It is the first staff reading taken after setup of instrument.
- **Fore sight(F.S.)**
  - It is the last staff reading taken denoting the shifting of the instrument.
- **Intermediate sight.(I.S.)**
  - It is staff reading taken on a point whose elevation is to be determined. All staff reading between B.S. and F.S. are Intermediate sight.
- **Change Point**
  - It is a point on which both fore and back sight are taken.

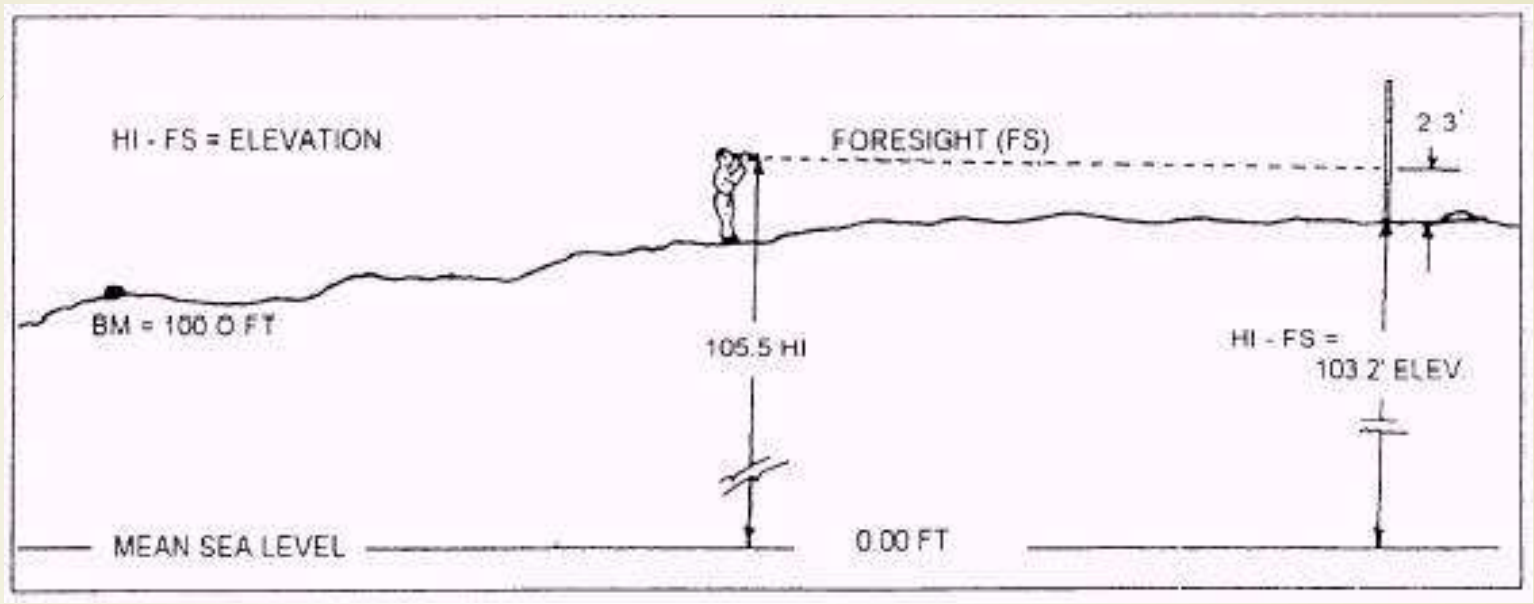
What's the idea

- Compute the elevation at point B is the elevation at point A is 100m




BACKSIGHT (BS)
HI = BM + BS
5.5
BM
BM + BS = 105.5, HI
100.0 FT
0.00 FT
MEAN SEA LEVEL

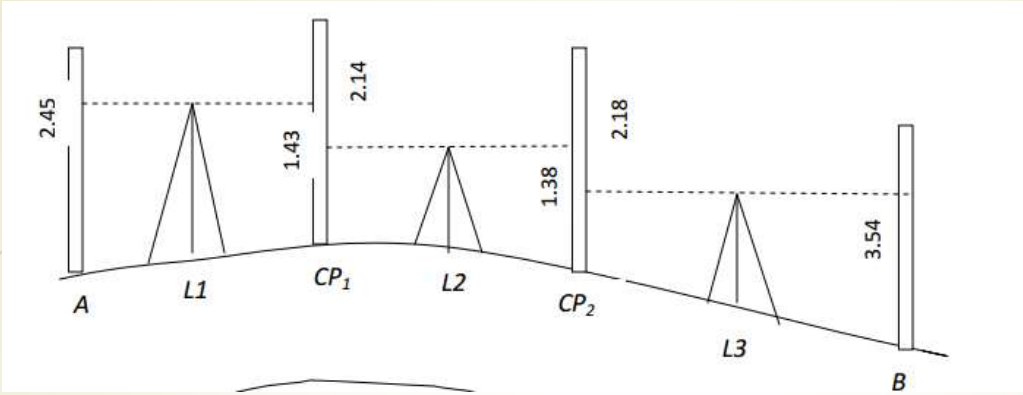



HI - FS = ELEVATION
FORESIGHT (FS)
2.3'
BM = 100.0 FT
105.5 HI
HI - FS =
103.2' ELEV
MEAN SEA LEVEL
0.00 FT

RULES

- The first reading you always take is **BACKSIGHT (BS)**
- The last reading you take is always **FORESIGHT (FS)**
- The readings you take in between are **INTERMEDIATE SIGHT (IS)**

Height of instrument method



Station	BS(m)	IS(m)	FS(m)	HI(m)	RL(m)	Remarks
A	2.45			102.45	100.00	
CP1	2.14		1.43			
CP2	2.18		1.38	101.74		
B			3.54			