

Levelling and Contouring

Prof. Bharat Lohani

Aman

Vertical Control :

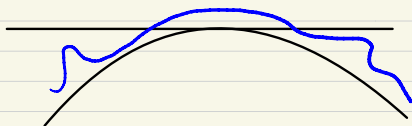
- ① Determining the elevations of points
- ② Fixing the points at desired elevations



We measure elevations with reference to something
Datum or Reference

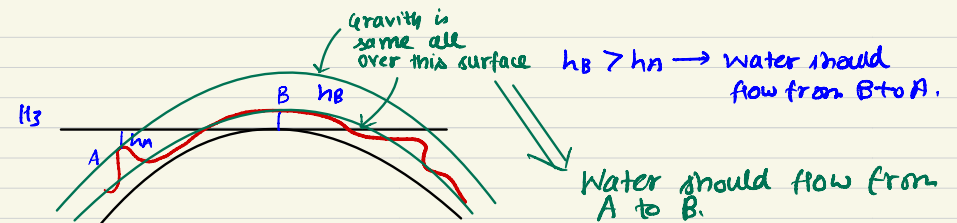
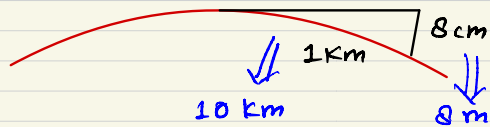
Datum (Reference)

↳ Horizontal Plane small



* If my area of my work is very small then we can always take a horizontal plane as my reference.

* Tangent at earth → It deviates by 8 cm in 1 km.

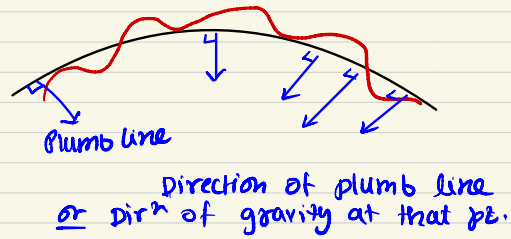


If I take h_3 surface as reference then it will give wrong result.

* If our area is large we can't take horizontal surface as reference. We have to find some other equipotential surface as reference.

Equipotential

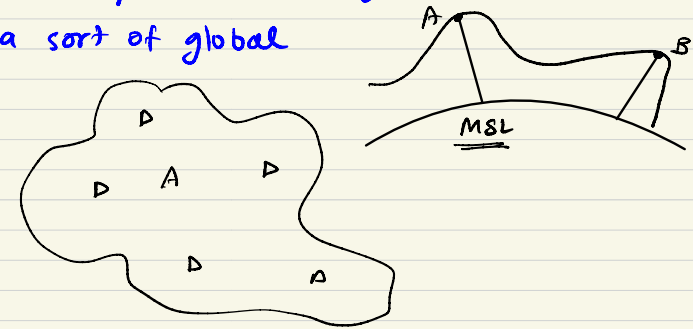
Geoid



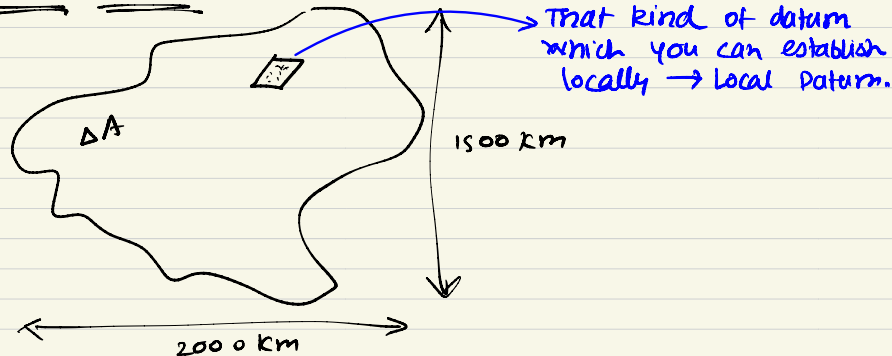
- * We should use Geoid as our reference because it is related to gravity.
- * Water should flow from higher pt. to a lower pt. This can't be realized by a horizontal surface so we have geoid which we take as a reference. We measure R.L.s or elevations from Geoid.

MSL : (Mean Sea Level)

- * MSL → The sea level has been observed over a period of about 19 years for all its variations and its averaged out. That becomes the reference or datum.
- * For every country, they have defined their MSL.
- * MSL is a sort of global datum.

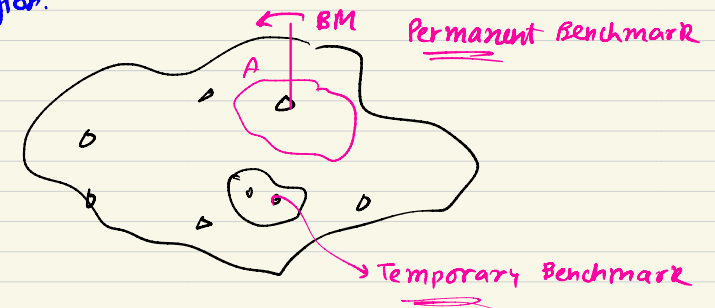


Local Datum :



Bench Mark :

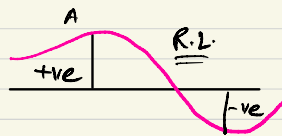
- * Height of some points have been accurately measured by some methods from MSL. We call these points as Bench marks.
- * We can use these points for our local survey at that region.



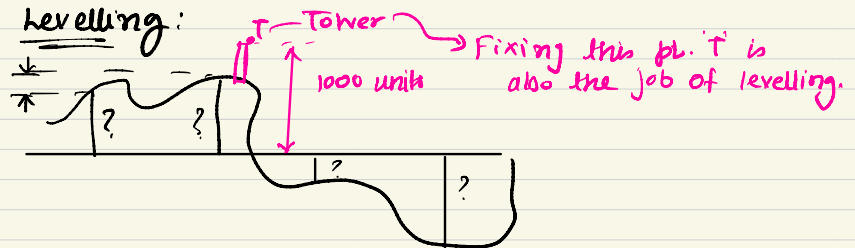
Reduced Level :

* Elevation of a point from the datum is the reduced level of that point.

* It could be +ve or -ve.



levelling:

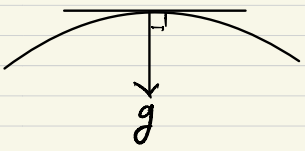
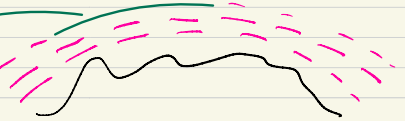


* Process of determining reduced levels or the difference in reduced levels of points is called levelling.

Level line :

Any line falling in surface is called level line.

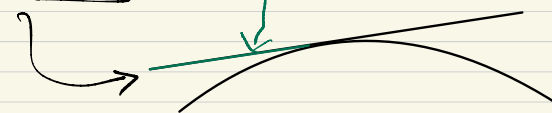
Level surface : Geoid



Horizontal line :

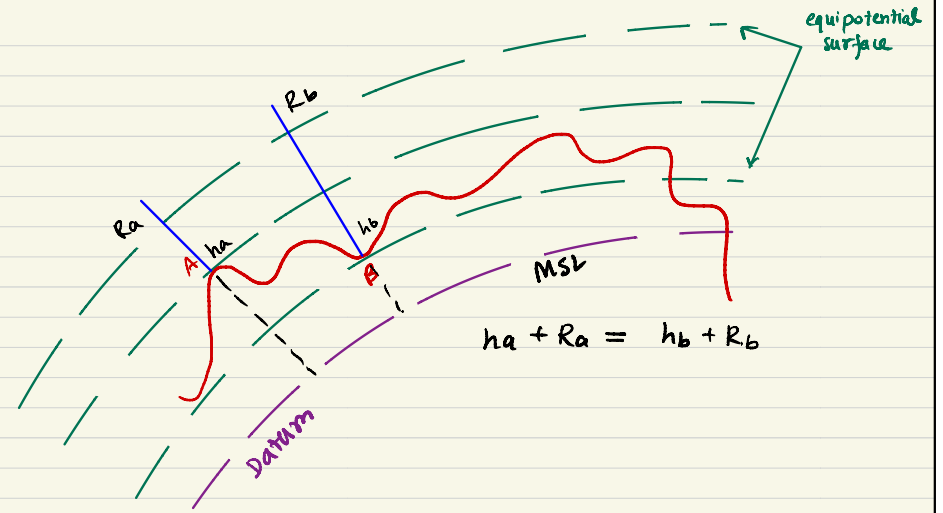
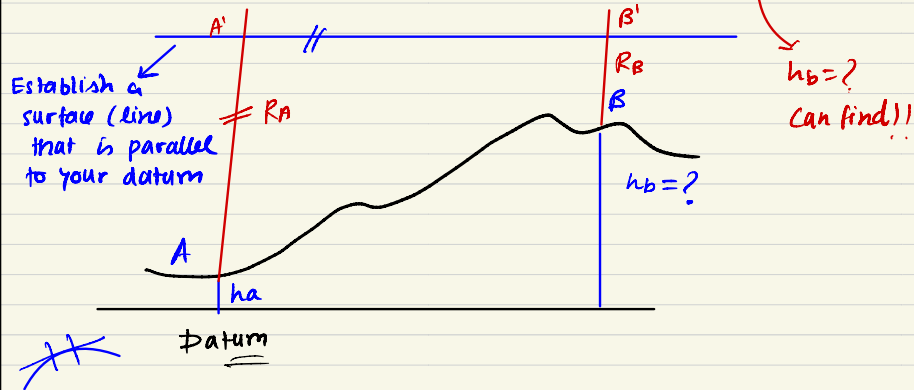
Any line on it

Horizontal surface :

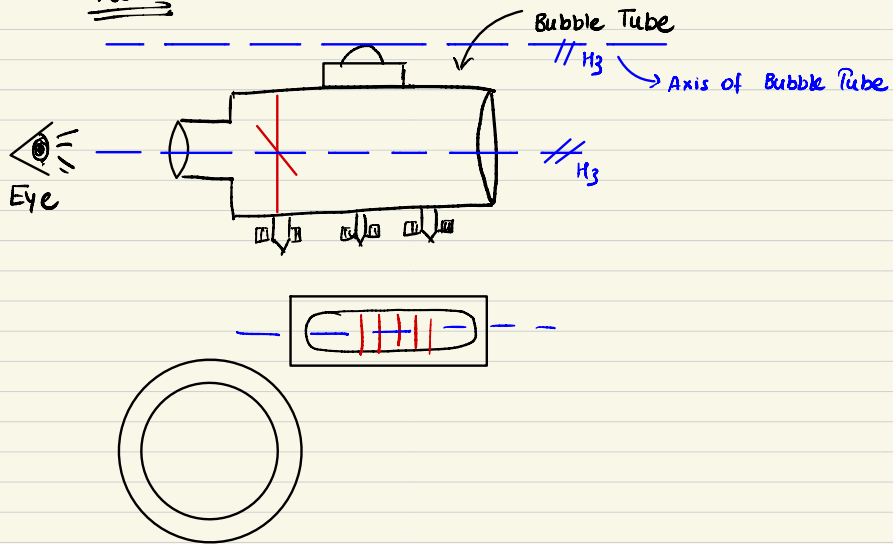


Principle of Levelling :

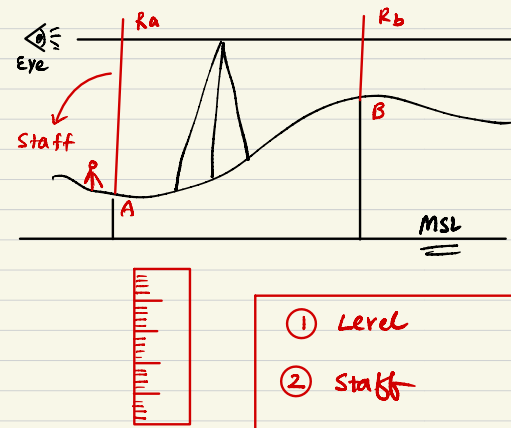
$$h_a + R_A = h_b + R_B$$



Level :



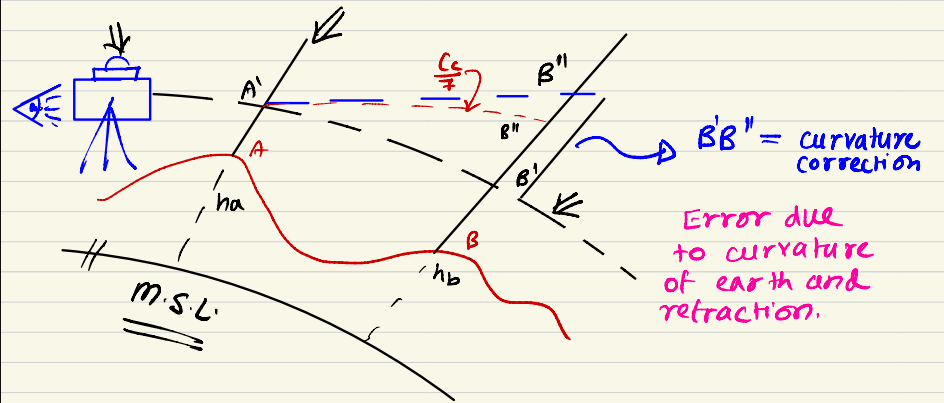
Staff :



Equipotential surface :

Problems with this

Curvature Effect : Level :

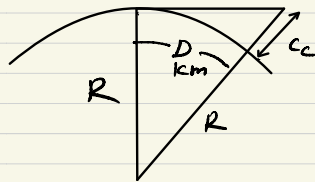


$BB'' = \text{Curvature correction}$

$$C_c = 0.0785 D^2$$

m km

1 km \Rightarrow 8 cm
10 km \Rightarrow 8 m

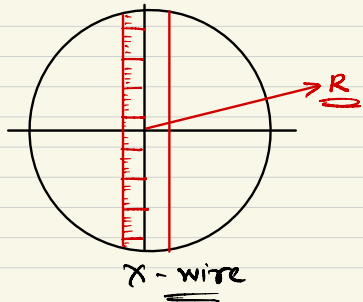


* Total Correction B''' R_b'''

$$C = C_c - C_r = 0.06735 D^2$$

m km

$$R_b' = R_b''' - C$$



Correction for Refraction

$$C_r = \frac{C_c}{7}$$