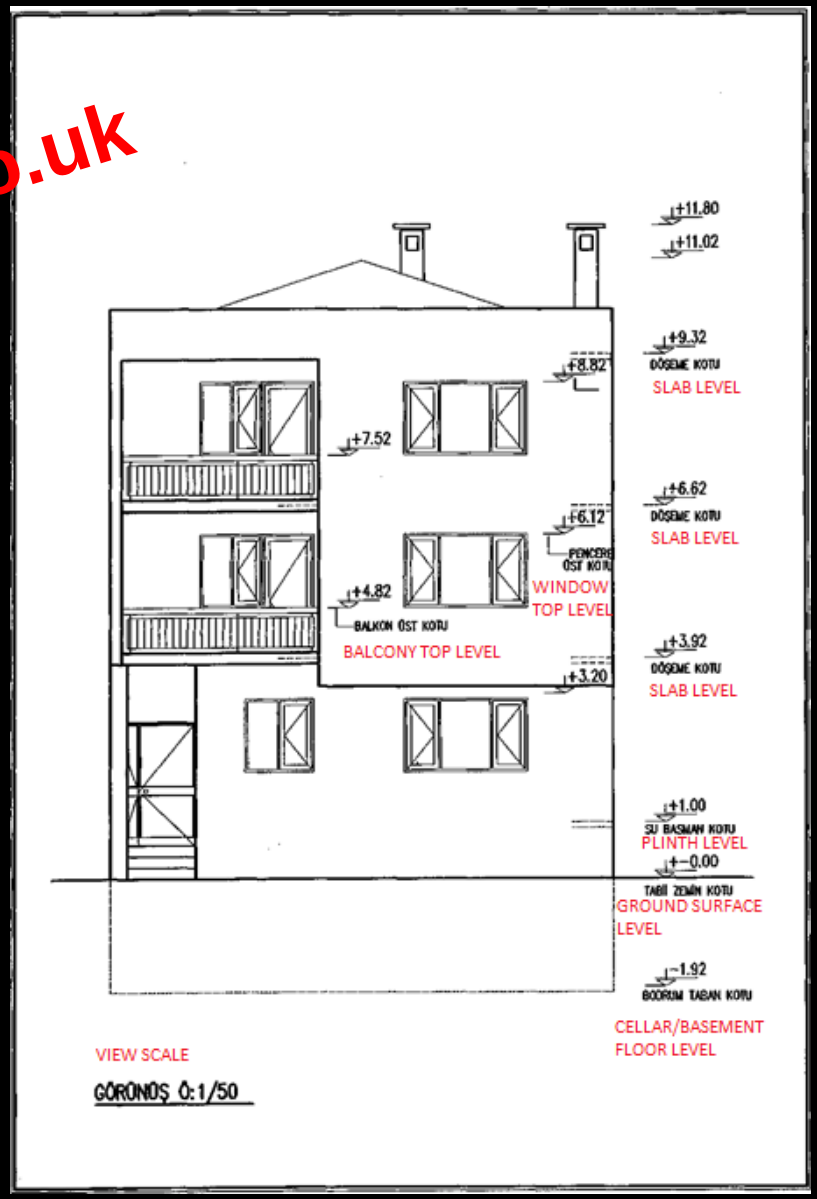
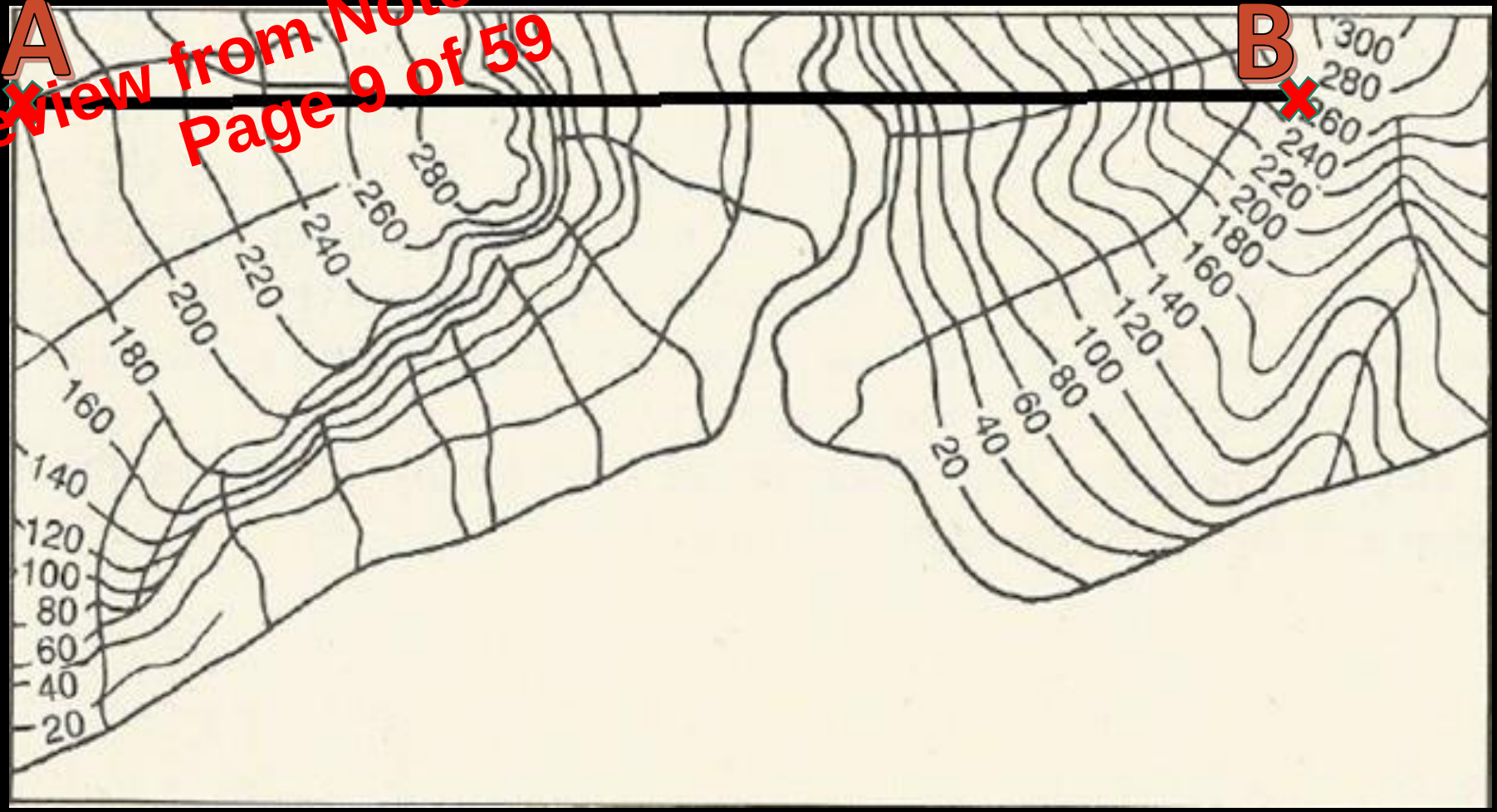


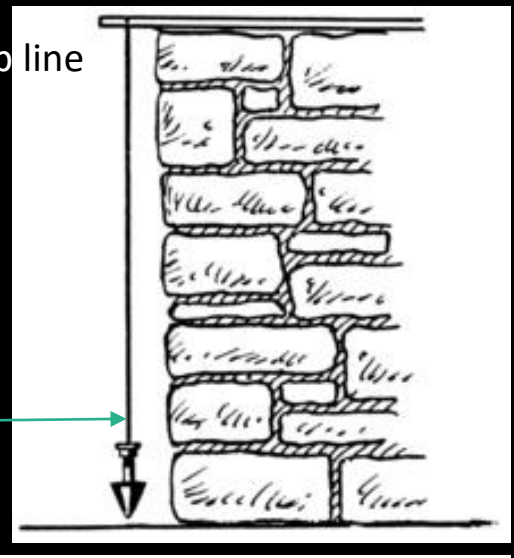
Building front views level shown by different symbols

Example: Determine the elevations of Line A-B at every contours and draw the longitudinal cross section.



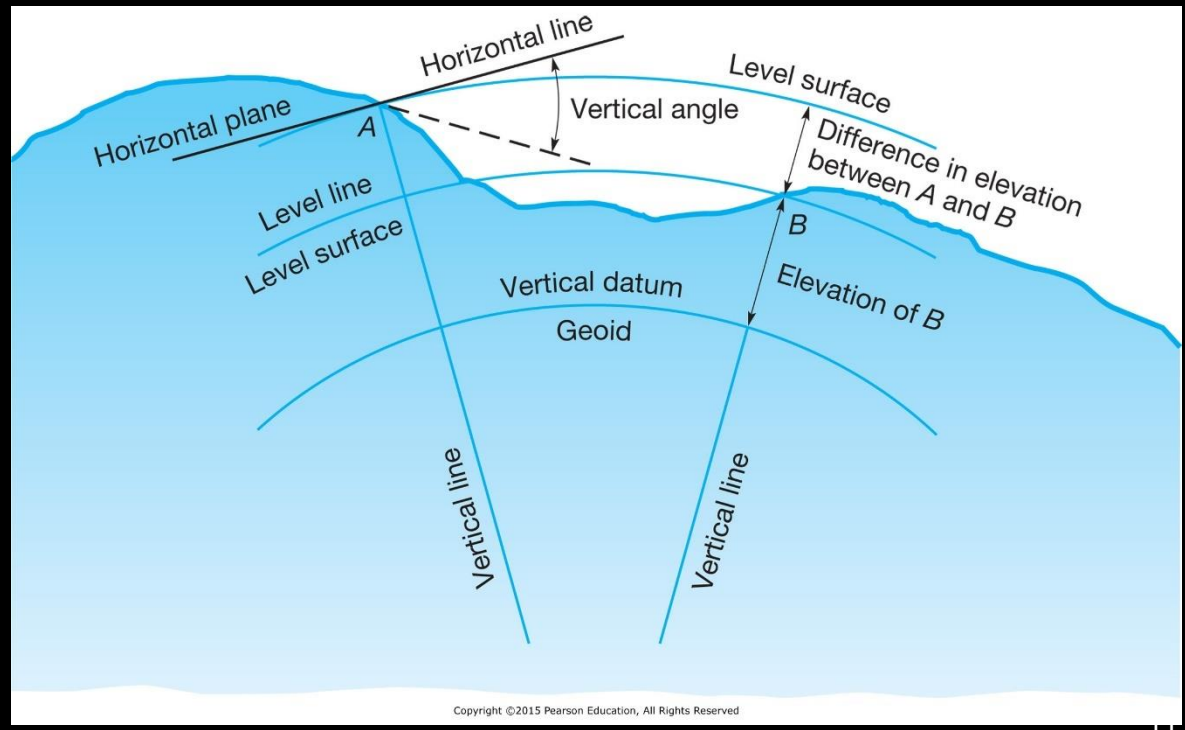
4.2 Definitions

Verticle line: A line that follows the local direction of gravity as indicated by a plumb line.



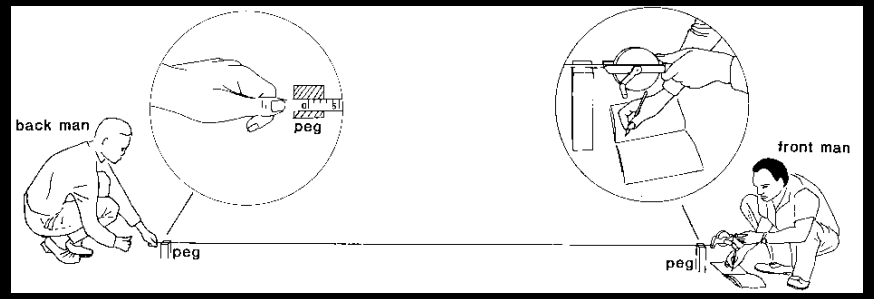
Level surface: A curved surface that at every point is perpendicular to the local plumb line.

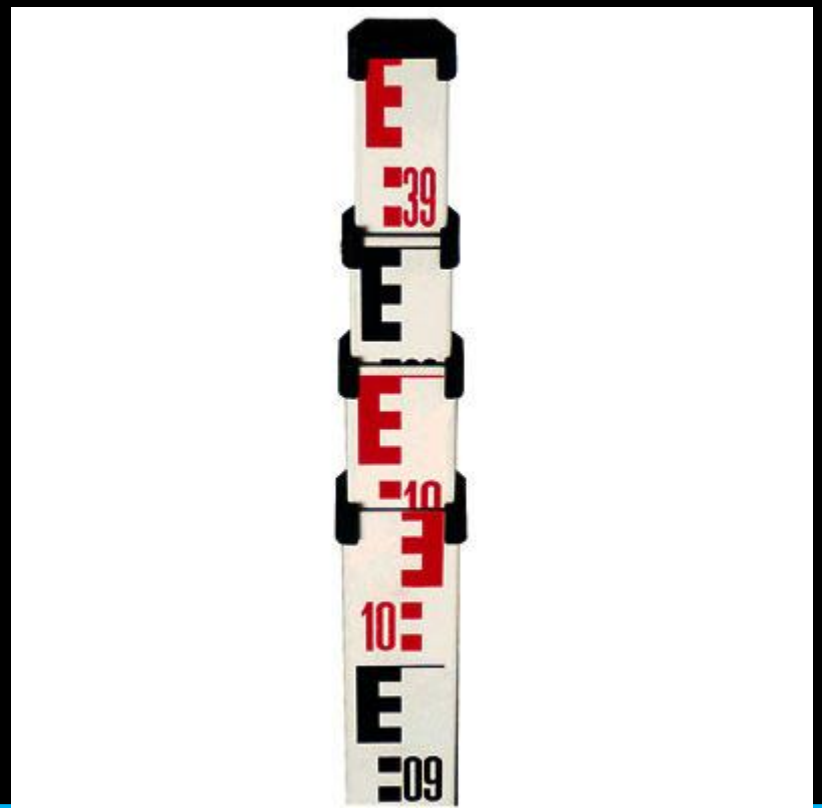
Level Line: A line in a level surface- therefore a curved line.



4.5.1 Measuring Vertical Distances By Taping or Electronic Methods

- Application of a tape to a vertical line between two points is sometimes possible. This method is used to measure depths of mine shafts, to determine floor elevations in condominium surveys, and in the layout and construction of multistory buildings, pipelines, etc.
- When water or sewer lines are being laid, a graduated pole or rod may replace the tape.





4.5.2 Differential Leveling

In this most commonly employed method, a telescope with suitable magnification is used to read graduated rods held on fixed points. A horizontal line of side within the telescope is established by means of a level vial or automatic compensator.

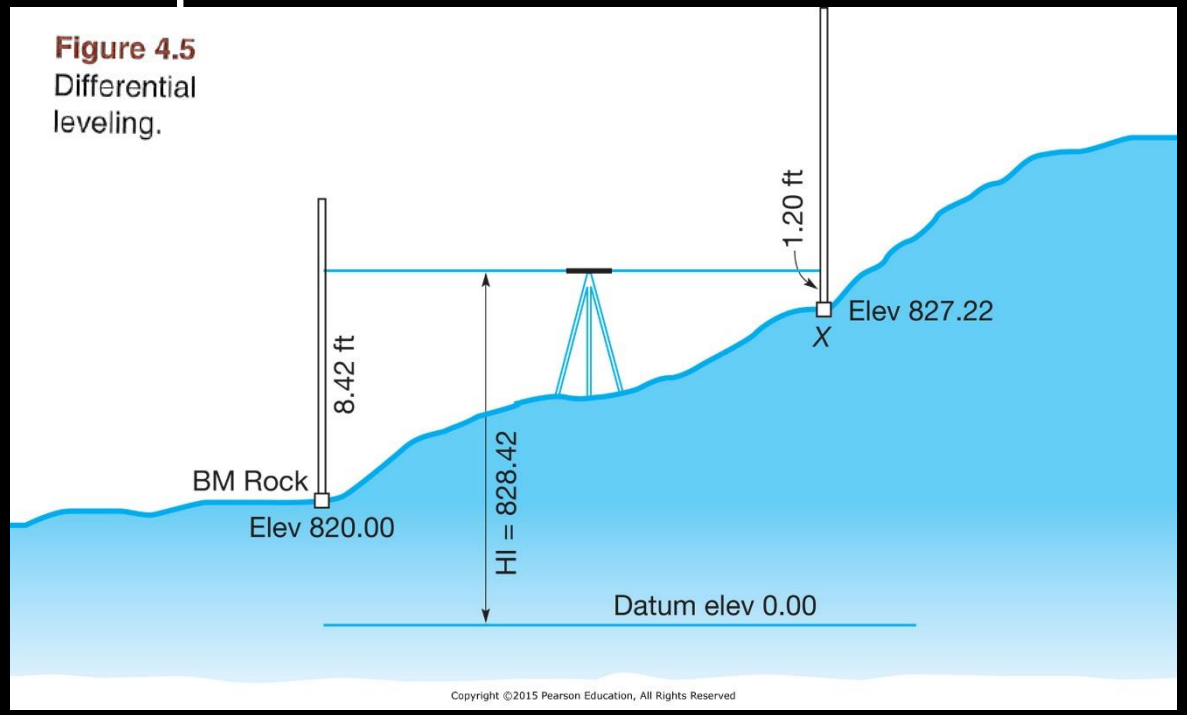
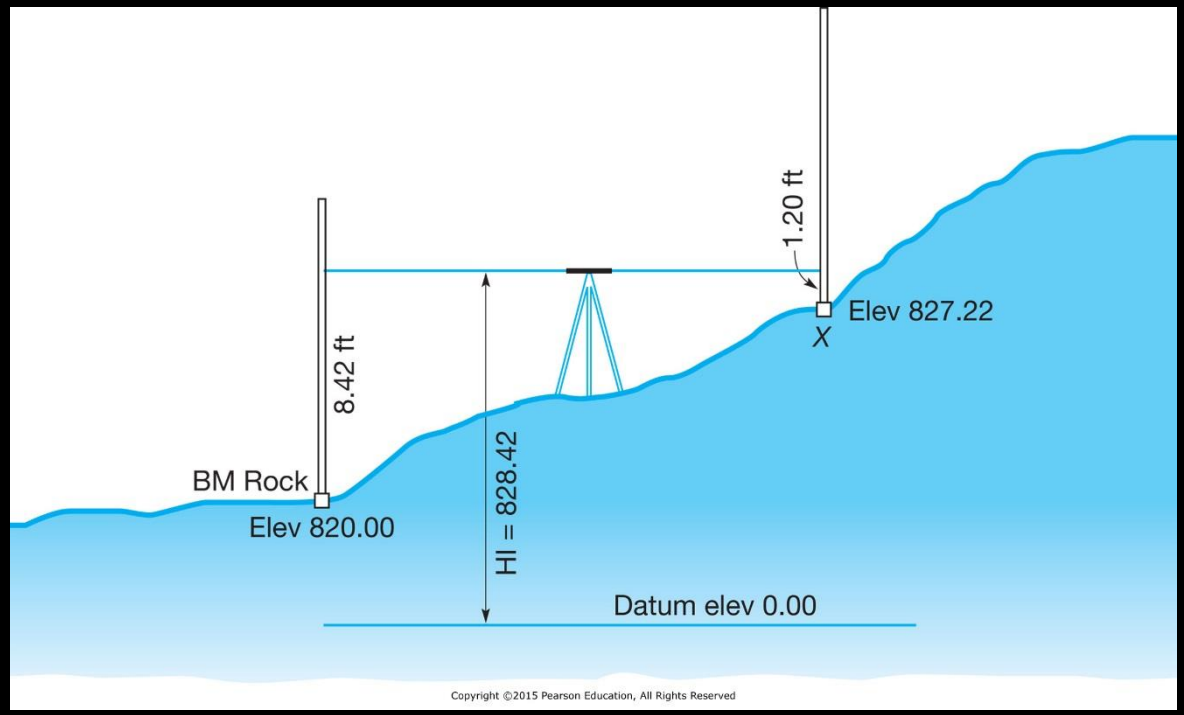


Figure 4.5 Differential leveling.

4.5.2 Differential Leveling

Procedure: An instrument is set up approximately halfway between BM rock and point X with a horizontal distance of 250 ft. Assume the elevation of BM rock is known to be 820.00 ft. After levelling the instrument, a plus sight taken on a rod held on the BM gives a reading of 8.42 ft. A plus sight (+S), also termed backsight (BS) is the reading on a rod held on a point of known or assumed elevation.



DIFFERENTIAL LEVELS

Sta.	+ B.S.	H.I.	− F.S.	Elev.	Adj. Elev.
BM Mil.	1.33			2053.21	2053.18
		2054.51		(−0.004)	
TP1	0.22		8.37	2046.14	2046.14
		2046.36		(−0.008)	
TP2	0.96		8.91	2038.45	2038.44
		2039.41		(−0.012)	
TP3	0.46		11.72	2027.69	2027.68
		2028.15		(−0.016)	
BM Oak	11.95		8.71	2019.44	2019.42
		2031.39		(−0.022)	
TP4	12.55		2.61	2028.78	2028.76
		2041.33		(−0.026)	
TP5	12.77		0.68	2040.65	2040.62
		2053.42		(−0.030)	
BM Mil.			0.21	2053.21	2053.18
Σ =	+40.24	Σ =	−40.21		

Page Check:
2053.18
+ 40.24
2093.42
− 40.21
2053.21 Check

GRAND LAKES UNIV. CAMPUS

BM Mil. to BM Oak

BM Mil. on GLU Campus SW of Engineering Bldg. 9.4 ft. north of sidewalk to instrument room and 1.6 ft. from Bldg. Bronze disk in concrete flush with ground, stamped "Mil"

29 Sept. 2014
Clear, Warm 70° F
T.E. Henderson N
J.F. King ϕ
D.R. Moore
Lietz Level #6

BM Oak is a temporary project bench mark located at corner of Cherry and Pine Sts., 14 ft. West of computer laboratory. Twenty penny spike in 18" Oak tree, 1 ft. above ground.

Loop Misclosure = 2053.21 − 2053.18 = 0.03

Permissible Misclosure = $0.02\sqrt{n} = 0.02\sqrt{7}$
= 0.05 ft.

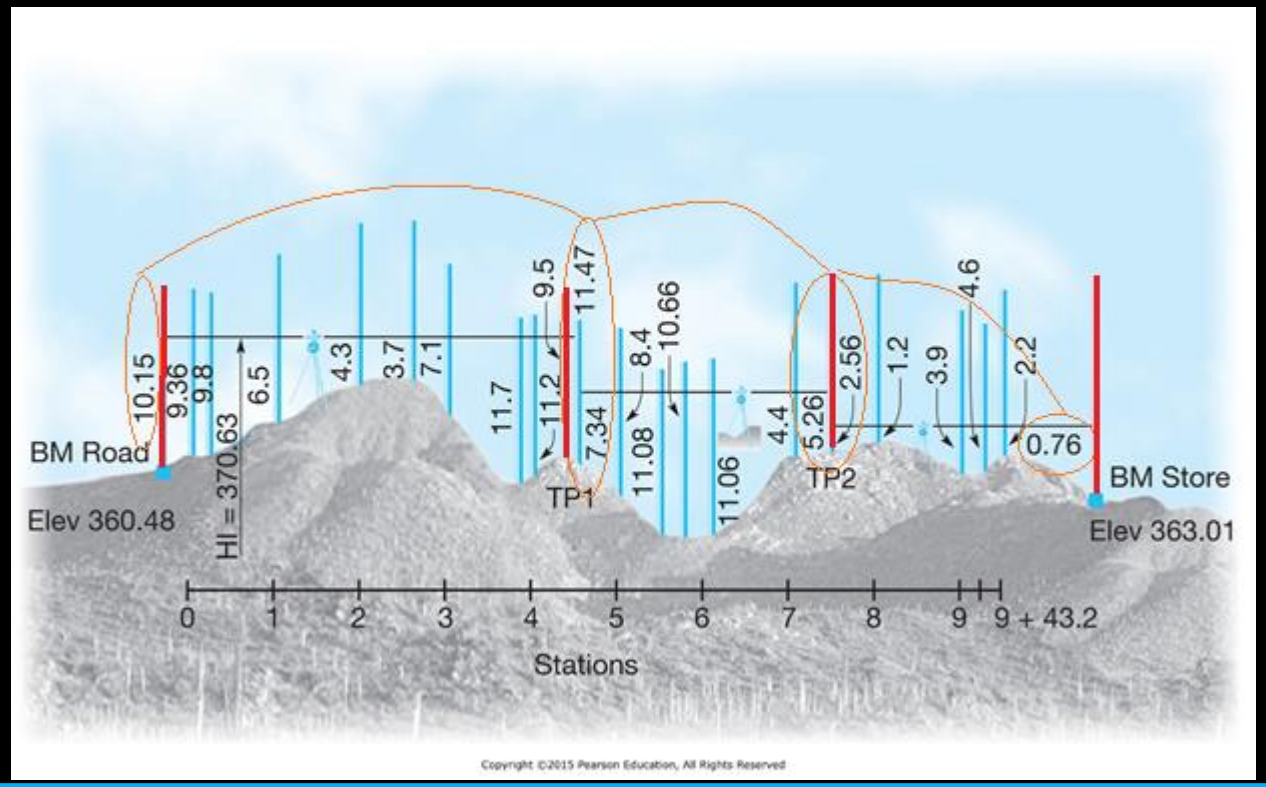
Adjustment = $\frac{0.03}{7}$ = 0.004′ per H.I.

7 x 0.004 = 0.028
0.028+0.002=0.030

J.E. Henderson

5.9.2. Field Procedures for Profile Leveling

In route surveying, a system called stationing is used to specify the relative horizontal position of any point along the reference line. The starting point is ususally designated with some arbitrary value like 10+00.



For each set up of leveling, backsight and foresight reading and many intermediates have been obtained.

5.12 Sources of Errors In Leveling

1.Instrumental

- Line of sight:
- Cross hair not exactly horizontal
- Rod not correct lenght
- Tripod legs loose

2.Natural

- Curvature of the Earth
- Refraction
- Temperature variations
- Wind
- Settlement of instrument and turning point

3.Personal

* Bouble not centered
* Faulty rod readings
* Parallax
* Rod handling
* Target setting