Experiment no. 6 : Measuring Height of object using Stadia Method

Prepared by: Eng. Shuroq Jamal

The Stadia is a method of measuring distances and height of points with theodolite when there is no possibility to take any staff readings at those points such as building corner or tower.
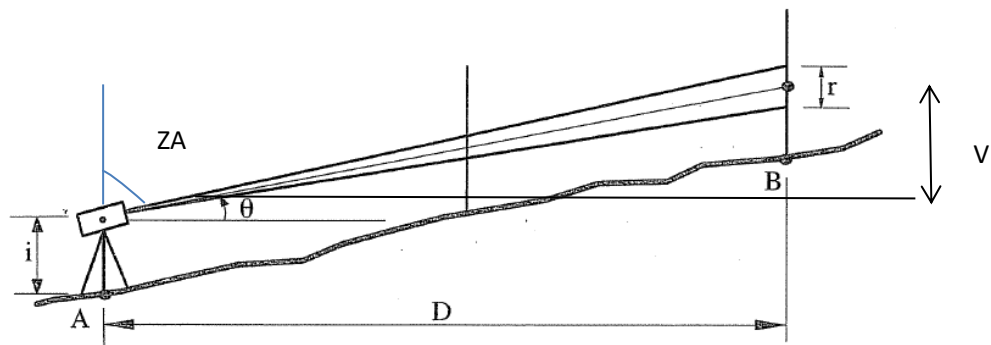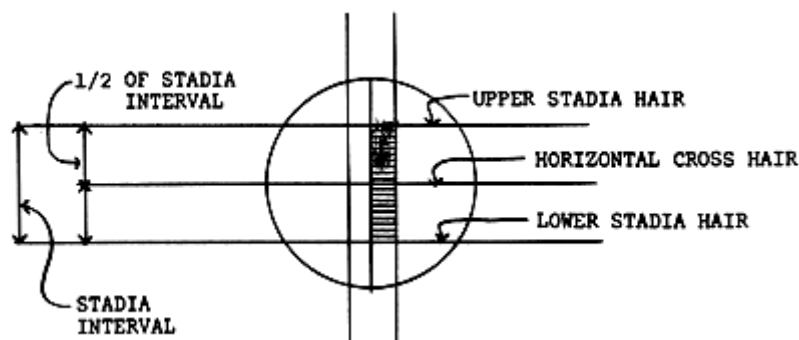

Vertical distance $V = \frac{1}{2} K r \sin(2 Z.A)$

Horizontal distance D= K r $\sin^2$ Z.A

Where K is stadia constant

      r is stadia interval = $r_1 - r_3$

Purpose: to find the height of tower (or point C)

Required Data :

Station	Point	HCR	Staff reading			ZA	HI
			r_1	r_2	r_3		
A	BM	------	√	√	√	√	√
A	B	0° 0' 0''	√	√	√	√	√
	C	HCR₁	-------	--------	-------	√	√
B	C	0° 0' 0''	-------	--------	-------	------	-------
	A	HCR₂	-------	--------	-------	------	-------

Where:

HCR: Horizontal circle reading

ZA: Zenith Angle

HI : Height of instrument

BM: Bench Mark

------ : No need to be measured

√ : Record measurement.

Calculations:

Use K = 100 , (F+C= 0) for all equations.

- H_{BM} : Known
- Find H_A

  $H_{BM} = H_A + HI_A + V_{A,BM} - r_{2\ BM}$ where : $V_{A,BM} = \frac{1}{2} K r \sin(2\ Z.A)$

  $$r = r1 - r3$$

- $\sphericalangle\ a = HCR1 - 0^\circ\ 0'\ 0''$
  $\sphericalangle\ b = HCR2 - 0^\circ\ 0'\ 0''$
  $\sphericalangle\ c = 180^\circ - \sphericalangle\ a - \sphericalangle\ b$

- $DAB = K r \sin^2 Z.A$ where : $r = r_1 - r_3$
- Find DAC from sine low
  $$\frac{DAC}{\sin b} = \frac{DAB}{\sin c}$$

- Find H c
  $H_c = H_A + HI_A + \frac{DAc}{\tan ZA}$