

Case-6

FIELD BOOK

Determination of Height of Any Object & Horizontal Distance

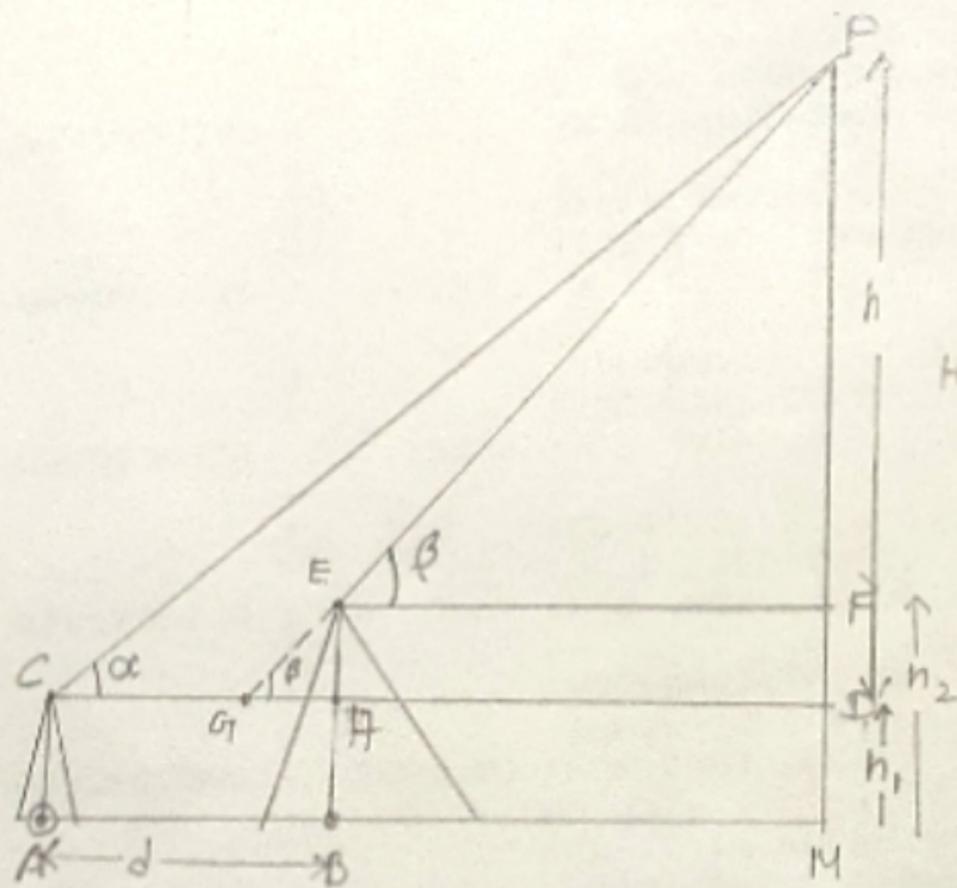
by
Transit Theodolite

[Base Inaccessible]

[Same Vertical Plane Method]

[Instrument Heights Are Different at Both Stations]

Instrument at	Object	Faces	Vertical Circle readings			Mean of Faces	Instrument height	Remarks
			VC	VD	Mean of Vernier			
A	P	Left	16°40'30"	16°40'30"	16°40'30"	16°40'15"	1.34 m	Horizontal distance between AB = 11 m.
		Right	16°40'	16°40'	16°40'			
B	P	Left	25°39'30"	25°39'30"	25°39'30"	25°40'	1.51 m	
		Right	25°40'30"	25°40'30"	25°40'30"			



where,

A = First station of observation

B = Second " " "

h_1 = Instrument height at station A

h_2 = Instrument height at station B

h = Height of the object above collimation line in respect of station A

HH = Height of the object above the ground

α = vertical angle at station A

β = " " " " "

d = Horizontal distance between A & B

$$AC \parallel BE \parallel PM$$

$$AM \parallel CD \parallel EF$$

$$\therefore BE = FM = h_2$$

$$AC = BH = h_1$$

$$AB = CH = d$$

$$\angle PEF = \angle EGH = \beta$$

[\because EF & CD are intersected by EG]

Step-I :- $EH = EB - BH$
 $EH = h_2 - h_1$

Step-II :- From rt $\angle \Delta PCD$

$$\frac{CD}{PD} = \cot \alpha$$

OR, $CD = PD \cdot \cot \alpha \dots \dots \dots \textcircled{1}$

Step-III :- From rt $\angle \Delta PGD$

$$\frac{GD}{PD} = \cot \beta$$

OR, $GD = PD \times \cot \beta \dots \dots \dots \textcircled{II}$

Step-IV :- From rt $\angle \Delta EGH$

$$\frac{GH}{EH} = \cot \beta$$

OR, $GH = EH \cdot \cot \beta$
 OR, $GH = (h_2 - h_1) \cdot \cot \beta \dots \dots \dots \textcircled{III}$

Step-V :- As G lies on the collimation line CD

$$GD - G_1D = CG_1$$

$$\text{OR, } CD - G_1D = CH - G_1H$$

$$\text{OR, } (PD \times \cot \alpha) - (PD \times \cot \beta) = d - \left\{ (h_2 - h_1) \times \cot \beta \right\}$$

$$\text{OR, } PD (\cot \alpha - \cot \beta) = d - \left\{ (h_2 - h_1) \times \cot \beta \right\}$$

$$\text{OR, } PD = \frac{d - \left\{ (h_2 - h_1) \times \cot \beta \right\}}{\cot \alpha - \cot \beta}$$

$$\text{OR, } PD = \frac{11 - \left\{ (1.510 - 1.340) \times \cot 25^\circ 40' \right\}}{\cot 16^\circ 40' 15'' - \cot 25^\circ 40'}$$

$$\text{OR, } PD = \frac{11 - \left\{ 0.17 \times 2.08094 \right\}}{3.33934 - 2.08094}$$

$$\text{OR, } PD = \frac{11 - 0.35375}{1.25840}$$

$$\text{OR, } PD = 8.4604 \text{ m.}$$

Step-VI :- Height of the object above ground in respect of station A

$$PM = (8.460 + 1.34) \text{ m.}$$

$$= 9.8 \text{ m.}$$

Step-VIII :- Horizontal distance between station A and base of the object

From rt $\angle \Delta PCD$

$$\frac{CD}{PD} = \cot \alpha$$

$$\text{or, } CD = PD \cdot \cot \alpha$$

$$\text{or, } CD = 8.460 \cdot \cot 16^\circ 40' 15''$$

$$\text{or, } CD = 28.25 \text{ m.}$$

Step-IX :- Horizontal distance between station B and base of the object

$$AM - AB = BM$$

$$\text{or, } CD - 11 = BM$$

$$\text{or, } 28.25 - 11 = BM$$

$$\text{or, } 17.25 = BM$$