CEST 50A - Plane Surveying
Taping Corrections

TEMPERTATURE CORRECTION:

$$C_T = [0.00000645\ (T-68°)]\ L$$

T = Temperture at time of Survey

L = Length of measurement

TENSION CORRECTION:

insert STD PULL

$$C_P = \frac{(P - 10)\ L}{A\ E}$$

P = Applied tension

L = Length of measurement

A = Cross-sectional area

E = 29,000,000 (Elasticity of Steel)

SAG CORRECTION:

$$C_S = -\frac{w^2\ l^3}{24\ P^2} \qquad \text{or} \qquad C_S = -\frac{W^2\ L}{24\ P^2}$$

w = Weight of tape per foot

W = Total weight of tape

L = Full length of tape (100" or 200')

l = (Length of measurement less than full length of tape)

P = Applied tension

TAPE LENGTH CORRECTION:

$$C_L = \frac{(l_a - l_n)\ L}{l_n}$$

l_a = Actual tape length

l_n = Nominal tape length

L = Length of measurement

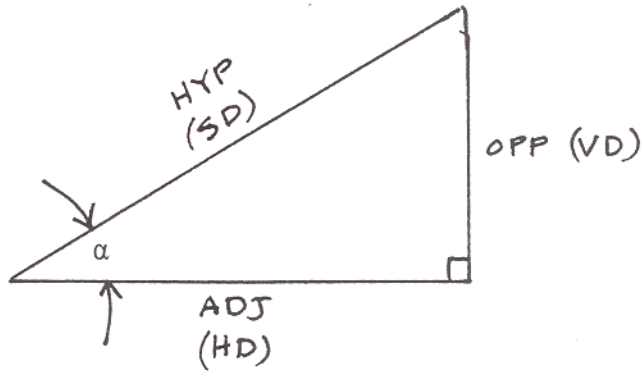
CEST 50A - Plane Surveying
Trig. Functions & Slope Reduction Equations

TRIGONOMETRIC FUNCTIONS

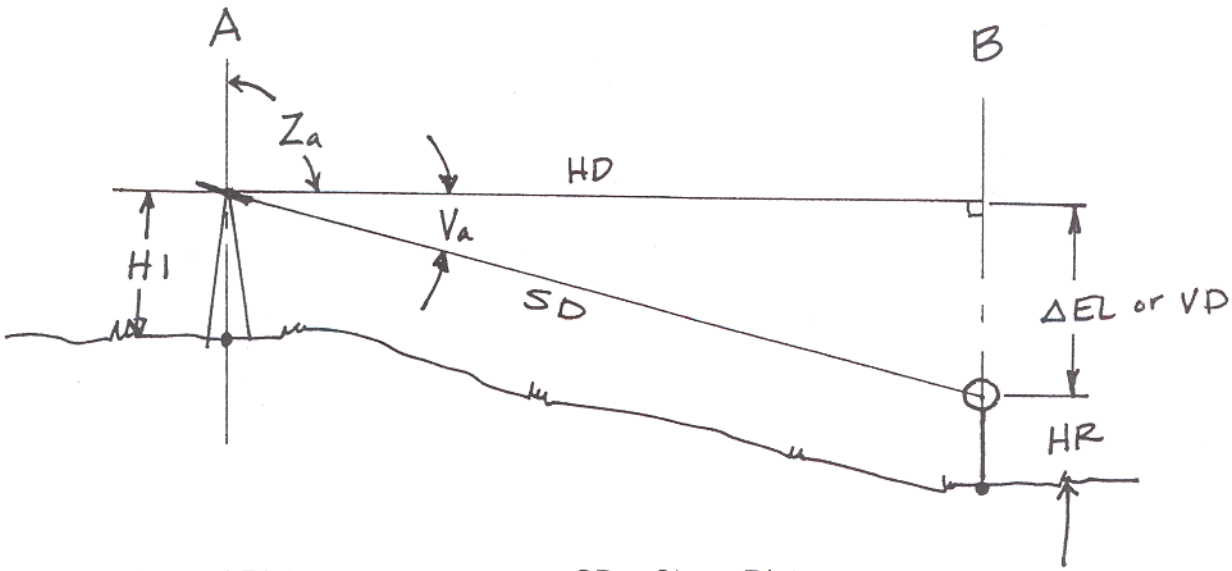
$$\sin \alpha = \frac{OPP}{HYP}$$

$$\cos \alpha = \frac{ADJ}{HYP}$$

$$\tan \alpha = \frac{OPP}{ADJ}$$



SLOPE REDUCTION FOR HORIZ. DIST. & ELEVATION



HD = Horizontal Distance

SD = Slope Distance

Z_a = Zenith Angle

V_a = Vertical Angle

Δ EL = Difference in Elevation

$V_a = (90° - Z_a)$

Equations:

$$HD = SD (\cos V_a)$$

$$HD = SD (\sin Z_a)$$

$$HD = \sqrt{SD^2 - \Delta EL^2}$$

$$\Delta EL = SD (\cos Z_a)$$

$$\Delta EL = SD (\sin V_a)$$

$$EL_B = EL_A + HI + \Delta EL - HR$$

CEST 50A Plane Surveying
Error Analysis Equations

Most Probable Value:

$$MPV = \frac{\Sigma M}{n}$$

MPV = most probable value or the mean value

ΣM = sum of the individual measurements

n = total number of measurements

Residuals:

$$v = (MPV - M)$$

v = residual in any measurement

MPV = most probable value

M = individual measurement

Standard Deviation:

$$\sigma = \pm\sqrt{\frac{\Sigma v^2}{(n-1)}}$$

σ = the standard deviation of a group of measurements

Σv^2 = sum of squares of individual residuals

n = total number of measurements

50%, 90% and 95% Errors:

$$E_{50} = 0.6745\,\sigma$$

$$E_{90} = 1.6449\,\sigma$$

$$E_{95} = 1.9599\,\sigma$$

σ = the standard deviation of a group of measurements

Error of the Mean:

$$E_{Mean} = \frac{E_{\%}}{\sqrt{n}}$$

$E_{\%}$ = the specified percentage error (E_{50}, E_{90}, or E_{95})

n = total number of measurements

Meter

39.37 in = 1 Meter

Meters to Feet

$xxx\ m \cdot \frac{39.37}{12}$

Feet to Meters

$xxx\ ft \cdot \frac{12}{39.37} =$

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1 gunter chain (ch) = 66 ft = 4 rods = 100 links

1 rod = 1 pole = 1 perch = 16.5 ft

1 mile = 5280 ft = 80 chains

Area 1 acre = $43560\ ft^2$

1 acre = $10\ ch^2$

1 hectare (ha) = 2.471 acres

1 hectare (ha) = $10000\ m^2$