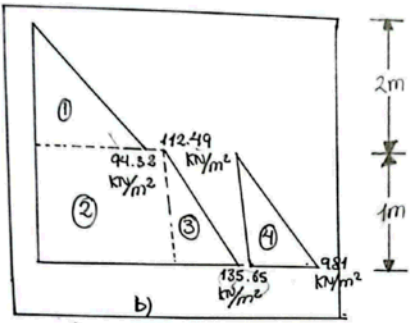
$$Z = 3m \quad \sigma_0' = \underbrace{15.72\frac{KN}{m^3}(2m)}_{1^{er}\ estrato} + \underbrace{\left(18.86\frac{KN}{m^3} - 9.81\right)(1m)}_{2^{do}\ estrato} = 40.49\ KN/m^2 \quad C' = 10\frac{KN}{m^2}$$

$$\sigma_p' = 40.49\ KN/m^2\ (2.56) + 2\left(10\frac{KN}{m^2}\right)\left(\sqrt{2.56}\right) = 135.65\frac{KN}{m^2}$$

Paso 5 : μ

$Z = 0$ a $2m$; $\mu = 0$

$Z = 2m$ a $3m$; $\mu = 9.81\frac{KN}{m^3}(1m) = 9.81\frac{KN}{m^2}$



Paso 6 : $P_p(m)$

Nº Área	Área	$P_p(m)$
1	$(2m)\ 94.32\frac{KN}{m^2}\left(\frac{1}{2}\right)$	$= 94.32\frac{KN}{m}$
2	$(1m)\ 112.49\frac{KN}{m^2}$	$= 112.49\frac{KN}{m}$
3	$(1m)\left(135.65\frac{KN}{m^2} - 112.49\frac{KN}{m}\right)\left(\frac{1}{2}\right)$	$= 11.58\frac{KN}{m}$
4	$(1m)\left(9.81\frac{KN}{m^2}\right)\left(\frac{1}{2}\right)$	$= 4.91\frac{KN}{m}$
		$223.30\frac{KN}{m}$

$P_p\bar{z} = \frac{1}{3}\left(94.32\frac{KN}{m^2}\right) + \frac{1}{2}\ (11.49) + \ldots$

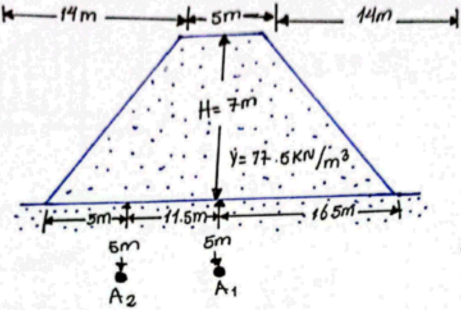
$\ldots\ \frac{1}{3}(11.58) + \frac{1}{3}\ (4.91)$

$P_p\bar{z} = 89.72 KN$

$\bar{z} = 89.72 KN / 223.30 KN/m = 0.40 m$

Ejemplo:

Se muestra un terraplén. Determine el incremento del esfuerzo debajo del terraplén en los puntos A1 y A2



factores de influencia ?

I' = factor de influencia prima

Paso 1: Determinar q_0

$q_0 = (\gamma)(H) = 17.5\ KN/m^3\ (7m)$

peso específico, altura $= 122.5\ KN/m^2$

Paso 2: Incremento $\sigma\ (A_1)$

$B_1 = 2.5m$ $\quad B_1 = \frac{2.5m}{5.0m} = 0.5$

$B_2 = 14m$ $\quad B_2 = \frac{14.0m}{5.0m} = 2.8$

Paso 3: I'

$I' = 0.44$

Paso 4: $\sigma_T(P.1)$

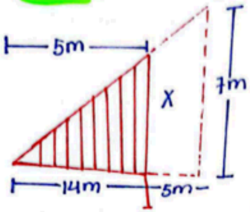
$\sigma_T(P.1) = \sigma_{(1)} + \sigma_{(2)}$

$\sigma_T(P.1) = q_0 \times I'_{izq} + q_0\, I'_{derecho}$

$\sigma_T(P.1) = q_0\,(I'_{izq} + I'_{der})$

$\sigma_T(P.1) = 122.5\ KN/m^2\ (0.44 + 0.44) = 107.8\ KN/m^2$

• Paso 5: $\Delta\sigma_{(A2)}$ (Primera parte)



$q_0 = \gamma' H$

$q_0 = 17.5 \frac{kN}{m^3} (2.5m)$

$q_0 = 43.75 \frac{kN}{m^2}$

$\frac{X}{5m} = \frac{7m}{14m}$; $B_1 = 0$

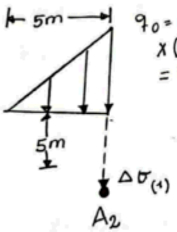
$X = 2.5m$; $B_2 = 5m$

$\frac{B_1}{z} = \frac{0}{5m} = 0$

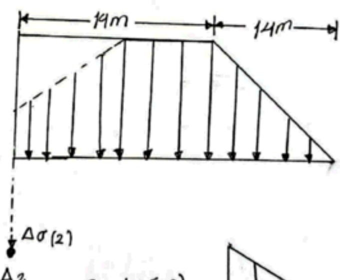
$\frac{B_2}{z} = \frac{5m}{5m} = 1$

$I'_{(P_1)} = 0.24$

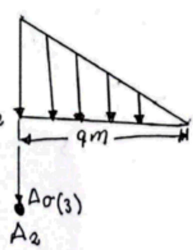
Ejemplo:



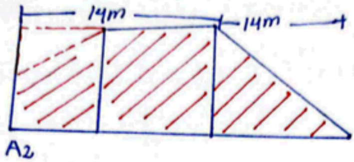
$q_0 = (2.5m) \times (17.5\ kN/m^3) = 43.75\ kN/m^2$ + $q_0 = (7m) \times (17.5\ kN/m^3) = 122.5\ kN/m^2$



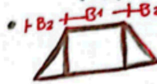
− $q_0 = (4.5m) \times (17.5\ kN/m^3) = 78.75\ kN/m^2$



Paso 6: $\Delta \bar{\sigma}_{(D2)}$ (segunda Parte)



• punto centro de un Δ es (2/3) (1/3)



• I' = calcula la distancia B_1 ; B_2

• I' = factor de influencia

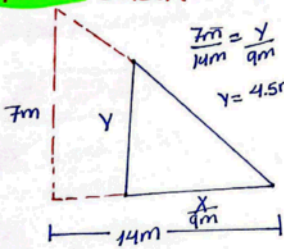
$q_0 = \gamma' H = 17.5 \frac{KN}{m^3} (7m) = 122.5 \frac{KN}{m^2}$

$B_1 = 14m$; $B_1/z = 14m/5m = 2.8$

$B_2 = 14m$; $B_2/z = 14m/5m = 2.8$

$I' = 0.49$

Paso 7: $\Delta \bar{\sigma}_{(D2)}$ (tercera parte)



$\frac{7m}{14m} = \frac{Y}{9m}$

$Y = 4.5m$

$X = \frac{2}{3} (14m) = 9.333 \approx 9m$

↓ punto centro ↓ distancia

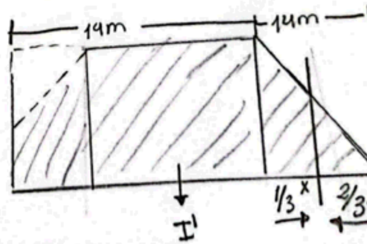
$q_0 = 17.5 \frac{KN}{m^3} (4.5m) = 78.75 \frac{KN}{m^2}$

$B_1 = 0$

$B_2 = 9m$

$\frac{B_1}{z} = \frac{0}{5m} = 0$; $I' = 0.33$

$\frac{B_2}{z} = \frac{9m}{5m} = 1.8$



Paso 8: $\Delta\sigma(2)$

$\Delta\sigma(2) = \Delta\sigma(2;G1) + \Delta\sigma(2;G2) - \Delta\sigma(2;G3)$

$\Delta\sigma(2) = q_0 I'(2;G1) + q_0 I'(2;G2) - q_0 I'(2;G3)$

$\Delta\sigma(2) = 43.75\frac{kN}{m^2}(0.24) + 122.5\frac{kN}{m^2}(0.49) - 78.75\frac{kN}{m^2}(0.33)$

$\Delta\sigma(2) = 44.76\frac{kN}{m^2}$

Paso 9: $\Delta\sigma(7)$

$\Delta\sigma(t) = \Delta\sigma(1) + \Delta\sigma(2) = 107.8\,kN/m^2 + 44.76\,kN/m^2 = 152.56\,kN/m^2$

Semana 4

Suelos Normalmente consolidados

$\sigma = \sigma' + \mu$

σ = tensión total o esfuerzo $= \gamma_s \times H$

σ' = tensión o esfuerzo efectiva $= \sigma' = \sigma - \mu$

μ = presión de poros $= \gamma_{agua} \times H$

Determinación Volumetrica: $-e$

$\sigma = \sigma' + \mu$

σ = tension

terzalli

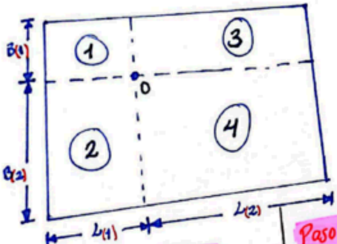
Braja

Ejemplo:

Un área rectangular flexible mide 2.50m x 5.00m en planta y soporta una carga de 15tn/m². Determine el esfuerzo vertical debido a la carga a una profundidad de 6.50m debajo del centro de área rectangular:

Esfuerzo debajo de cualquier punto de un área rectangular flexible cargada:

Paso 1: Identificar el área a trabajar



Paso 2: Determine m y n:

$$m = \frac{B}{z} = \frac{x}{z}$$

$$n = \frac{L}{z} = \frac{y}{z}$$

Datos:

$B = 2.50m$

$L = 5.00m$

$z = 6.50m$

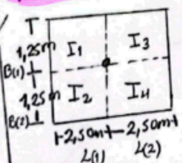
$q_0 = 15\ tn/m^2$

$m = 0{,}2$

$n = 0{,}4$

$I = 0{,}0328$

Paso 1: B; L



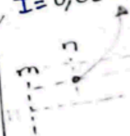
Paso 2: m y n

$$m = \frac{1{,}25}{6.50} = 0{,}2$$

$$n = \frac{2{,}50}{6.50} = 0.4$$

Paso 3: Determine I (tabla)

$I = 0{,}0328$



Paso 4:

$$\Delta\sigma = q_0(I_1 + I_2 + I_3 + I_4)$$

$$\Delta\sigma = q_0\, I_c = q_0\, 4(I)$$

$$\Delta\sigma = 15\ tn/m^2 \times 4(0{,}0328)$$

$$\Delta\sigma = 1{,}97\ tn/m^2$$

∴ a una $z = 6.50\ m$

$\Delta\sigma = 1{,}97\ tn/m^2$

Paso 1: Formula

Paso 2: "m_1" y "n_1"

$$m_1 = \frac{5.00\,m}{2.50\,m} = 2.00$$

$$n_1 = \frac{6.50\,m}{\left(\frac{2.50}{2}\,m\right)} = 5.20$$

Paso 3: "I_c"

$I_c = 0.131$

$\Delta\sigma = q_0\, I_c$

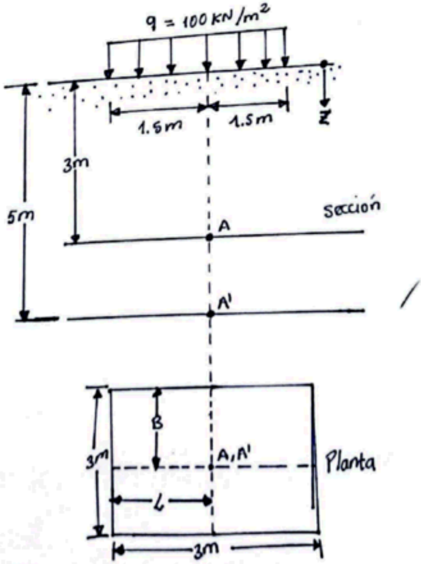
$\Delta\sigma = 15\,tn/m^2\,(0.131)$

$= 1.97\,tn/m^2$

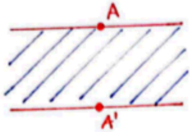
Ejemplo 2:

Determine el incremento promedio del esfuerzo debajo del centro del área cargada entre $z = 3.00m$ y $z = 5.00m$ (Entre el punto A y A')

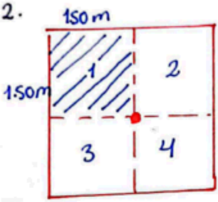
Determine el incremento promedio del esfuerzo debajo de un área rectangular



1. interpretación :



2.



Paso 1: m_2 y n_2 para ; H_2

$$m_2 = \frac{1.50m}{5.00\,m} = 0.3$$

$$n_2 = \frac{1.50m}{5.00\,m} = 0.3$$

Paso 2: $I_a(H_2)$: 0.13

Paso 3: m_2 y n_2 ; H_1

$$m_2 = \frac{1.50m}{3.00m} = 0.5$$

$$n_2 = \frac{1.50\,m}{3.00\,m} = 0.5$$

Paso 4: $I_a(H_1)$: 0.17

Paso 5: $\Delta\sigma_{prom}\left(\frac{H_2}{H_1}\right) = 100\,\frac{KN}{m^2}\left[\frac{5m(0.13) - 3m(0.17)}{5m - 3m}\right]$

$$\Delta\sigma_{prom}\left(\frac{H_2}{H_1}\right) = 7\,\frac{KN}{m^2}$$

$$\Delta\sigma_{prom(T)}\left(\frac{H_2}{H_1}\right) = 4\left(7\,\frac{KN}{m^2}\right)$$

$$= 28\,\frac{KN}{m^2}$$