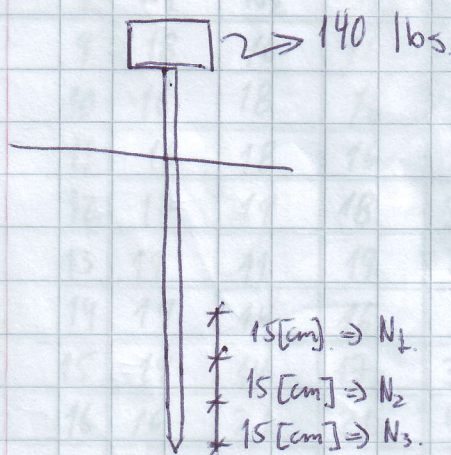


SPT Standard penetration Test.



$$N = N_1 + N_2 + N_3$$

$$0,5 < C_N < 1,5$$

$$N = C_N \cdot N^{SPT}$$

$$C_N = 1,7$$

$$0,7 + \frac{\sigma_v'}{\gamma_{soil}}$$

$$\downarrow [kg/cm^2]$$

- Usado en suelos arenosos.
- Informe debe venir c/ N^1, N^2 y N^3
- Grava los N son muy grandes y los anillos generan mucho roce con el piezo.

P] Se requiere hacer un estudio de la existencia de un estrato de arena bajo el de una Grava arenosa. Usted posee los datos de un SPT realizado por IDIEM. Determine los estratos más capaces.

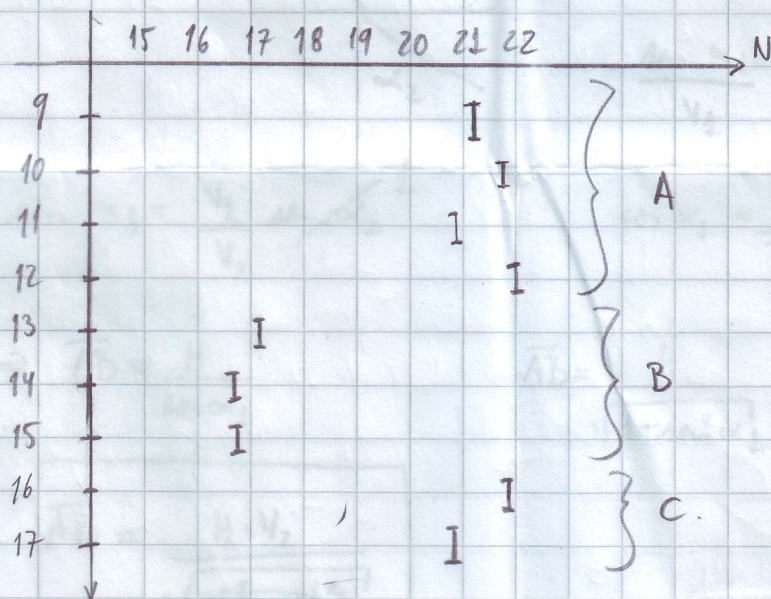
8	6S	$\gamma_t = 2,2 [t/m^3]$	
5	$\gamma_s = 2 [t/m^3]$		γ_z

z	N_1	N_2	N_3
9	18	16	16
10	16	18	16
11	16	18	16
12	17	19	18
13	19	11	19
14	19	14	16
15	19	14	17
16	16	21	21
17	19	21	20

Sol

C5	C1	C2	C3	C4	C6 σ_v'	C7	C8
Z	N ₁	N ₂	N ₃	N ^{SPT}	$\left[\frac{t}{m^2}\right]$	C _N	N
9	18	16	16	32	18,6	0,664	21,25
10	16	18	16	34	19,6	0,639	21,73
11	16	18	16	34	20,6	0,616	20,94
12	17	19	18	37	21,6	0,594	21,99
13	19	11	19	30	22,6	0,574	17,23
14	19	14	16	30	23,6	0,556	16,67
15	19	14	17	31	24,6	0,538	16,68
16	16	21	21	42	25,6	0,521	21,9
17	19	21	20	41	26,6	0,506	20,74

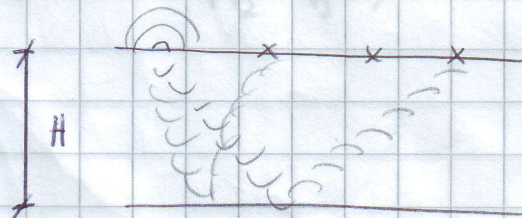
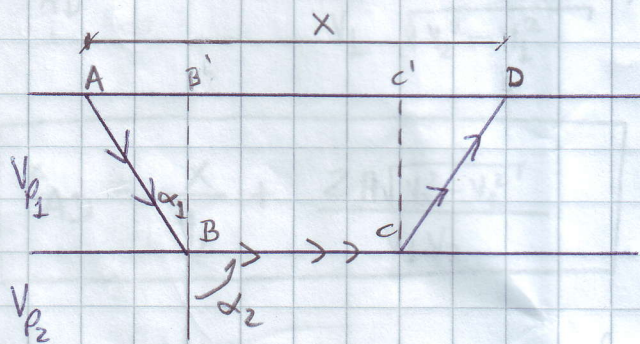
$$\sigma_v' = 8 \cdot 2,2 + (z - 8)1$$



Claramente A y C tienen resistencia similares

B tiene menor resistencia que el resto.

Perfil Sísmico.

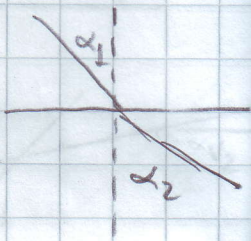


$$t_{ABCD} = t_{AD} = 2 t_{AB} + t_{BC}$$

$$t_{AB} = \frac{\overline{AB}}{v_1}$$

$$t_{BC} = \frac{\overline{BC}}{v_2}$$

Ley de Snell:



$$\frac{\sin \alpha_1}{v_1} = \frac{\sin \alpha_2}{v_2}$$

$$\sin \alpha_1 = \frac{v_1}{v_2} \sin \alpha_2$$

$$\cos \alpha_1 = \frac{H}{\overline{AB}}$$

$$\Rightarrow \overline{AB} = \frac{H}{\cos \alpha_1}$$

$$\overline{AB} = \frac{H}{\sqrt{1 - \sin^2 \alpha_1}} = \frac{H}{\sqrt{1 - \frac{v_1^2}{v_2^2}}}$$

$$\boxed{\overline{AB} = \frac{H \cdot v_2}{\sqrt{v_2^2 - v_1^2}}}$$

$$\overline{BC} = X - 2 \overline{AB'}$$

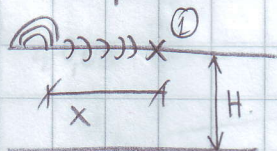
$$\tan \alpha_1 = \frac{\overline{AB'}}{H} \Rightarrow \overline{AB'} = H \cdot \tan \alpha_1$$

$$\tan \alpha_1 = \frac{\sin \alpha_1}{\cos \alpha_1} = \frac{v_1/v_2}{\frac{H}{\overline{AB}}} = \frac{v_1}{v_2} \cdot \frac{\overline{AB}}{H} = \frac$$

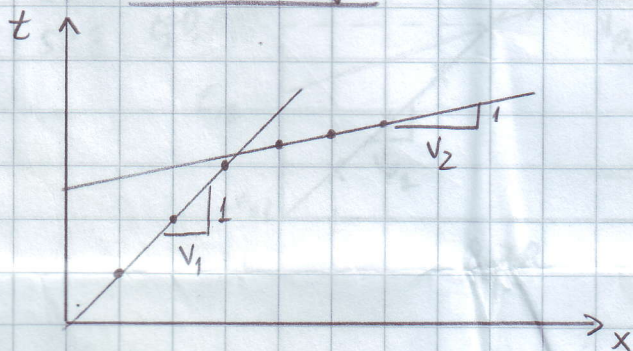
$$t_{AD} = 2 \cdot H \cdot \frac{v_2}{v_1} \cdot \frac{1}{\sqrt{v_2^2 - v_1^2}} + \frac{1}{v_2} \left(x - \frac{2 H \cdot v_1}{\sqrt{v_2^2 - v_1^2}} \right)$$

$$t_{AD} = \frac{x}{v_2} + \frac{2 H \sqrt{v_2^2 - v_1^2}}{v_1 v_2}$$

para los primeros geofonos la onda es directa.



$$t_{AB} = \frac{x}{v_1}$$

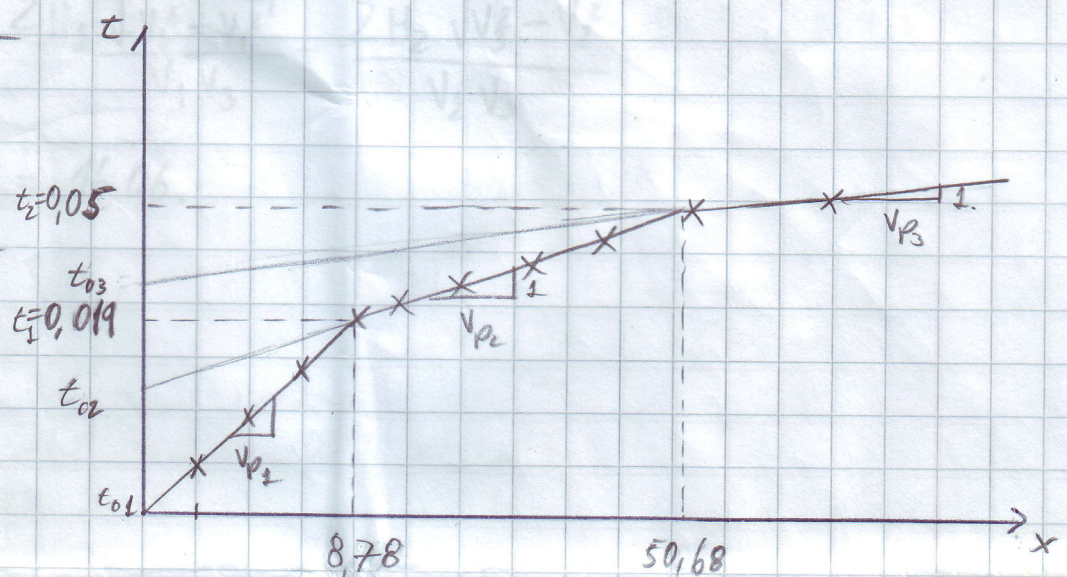


P) Determinar velocidades de propagação
e altura do estrato.

y altura do estrato.
[mts] [ms]

X	t
2,5	5,5
5	11,1
7,5	16,1
15	24
25	30,3
35	38,2
45	46,1
55	51,3
60	52,8

Gráficos.



$$V_{p3} = 3333,3 \text{ [m/s]}, \quad V_{p2} = 1347,7, \quad V_{p1} = 472$$

$$t_1 = 0,00212 \cdot x + 3 \times 10^{-4} \quad t_2 = 7,42 \times 10^{-4} \cdot x + 0,0124 \quad t_3 = 3 \times 10^{-4} \cdot x + 0,0348$$

$$t_{01} = 0,0003 \quad t_{02} = 0,0124 \quad t_{03} = 0,0348$$

$$t = \frac{x}{V_2} + \frac{2H \sqrt{V_2^2 - V_1^2}}{V_1 V_2}$$

$$0,049 = \frac{8,78}{1347,7} + \frac{2 \cdot H \sqrt{1347,7^2 - 472^2}}{1347,7 \cdot 472} \Rightarrow H_1 = 3,4 \text{ [m]}$$

o tambien se puede llegar de la sgta manera.

$$t_{02} = \frac{2H}{V_2} + \frac{2H \sqrt{V_2^2 - V_1^2}}{V_1 V_2} \Rightarrow H = \frac{t_{02} \cdot V_1 V_2}{2 \sqrt{V_2^2 - V_1^2}} = 3,1 \text{ [m]}$$

$$t_{03} = \frac{2H_1 \sqrt{V_3^2 - V_1^2}}{V_1 V_3} + \frac{2H_2 \sqrt{V_3^2 - V_2^2}}{V_2 V_3}$$

$$\Rightarrow H_2 = 16,06.$$

	H ₁	H ₂	H ₃
7	10	11	11
8	11	12	12
9	12	13	13
10	13	14	14
11	14	15	15
12	15	16	16
13	16	17	17
14	17	18	18
15	18	19	19
16	19	20	20
17	20	21	21