

In Situ Tests

•SPT (Standard Penetration Test)	N
•CPT (Cone Penetration Tests)	q_c
•In Situ Vane	T
•Pressuremeter Test	V,P
•Dilatometer Test	P
•Plate Loading Test	Q

- N:standard penetration test number
- q_c :cone point resistance(tip resistance)
- T:torque
- V:volume
- P:pressure
- Q:load

SPT(Standard Penetration Test)

- most widely used test
- cheap
- easy
- It is repeated at every 1.5 m of intervals.
- A number (N) is obtained from this test.
- boring = bore hole

SPT

- There is a hammer (63.5 kilograms)
- There is a soil sampler (45 cm in length)
- This hammer is dropped onto the soil sampler to push it into the soil layer.
- The number of blows required for the first 15 cm of penetration is recorded. (let the number of drops needed for first 15 cm of penetration be 5) at 1.5m
- The number of blows required for the second 15 cm of penetration is recorded. (say 8) at 1.5m
- The number of blows required for the last 15 cm of penetration is recorded. (say 10) at 1.5 m

SPT

Now, at 1.5 m,

.SPT Number = $8+10=18$

.This process is repeated at every 1.5m.

.1.5m

.3.0m

.4.5m

.6.0m

.and so on.

If 50 drops provide no penetration of 15 cm

N=refu (50)

Or

If successive 10 drops provide no advance of
sampler

N=refu (50)

• N

• N_{ave}

• N_{ort}

• N_1

• N_{60}

• N_{30}

• N_{70}

• $N_{1,60}$

• $N_{1,70}$

• $N_{\text{corrected}}$

N may be corrected according to some factors

•stress level C_N

• energy C_E

diameters of borings C_B

•Sampling C_S

•length of rods C_R

•To do so some correction factors such as C_N, C_E, C_B, C_S, C_R are used.

• $N_1 = NC_N$

• $N_{60} = NC_E$

• $N_{1,60} = NC_N C_E C_B C_S C_R$

$$\bullet C_E = 0.75 \text{ or } 0.8$$

$$\text{or } \frac{\text{hammer efficiency}}{60}$$

$$\text{or } \frac{\text{hammer efficiency}}{70}$$

$$\bullet C_N = \sqrt{\frac{95.7 \text{ kPa}}{\dot{\sigma}_{v0}}} \cong \sqrt{\frac{100 \text{ kPa}}{\dot{\sigma}_{v0}}}$$

• (can't be greater than 1.7)

Depth (m)	N _x for 1. 15cm	N _y for 2. 15 cm	N _z for 3.15 cm	SPTN
1.5	1	1	3	4
3.0	3	4	6	10
4.5	4	4	8	12
6.0	7	8	10	18

$$N = N_y + N_z \quad N_1 = NC_N \quad N_{60} = NC_E \quad N_{1,60} = NC_N C_E$$

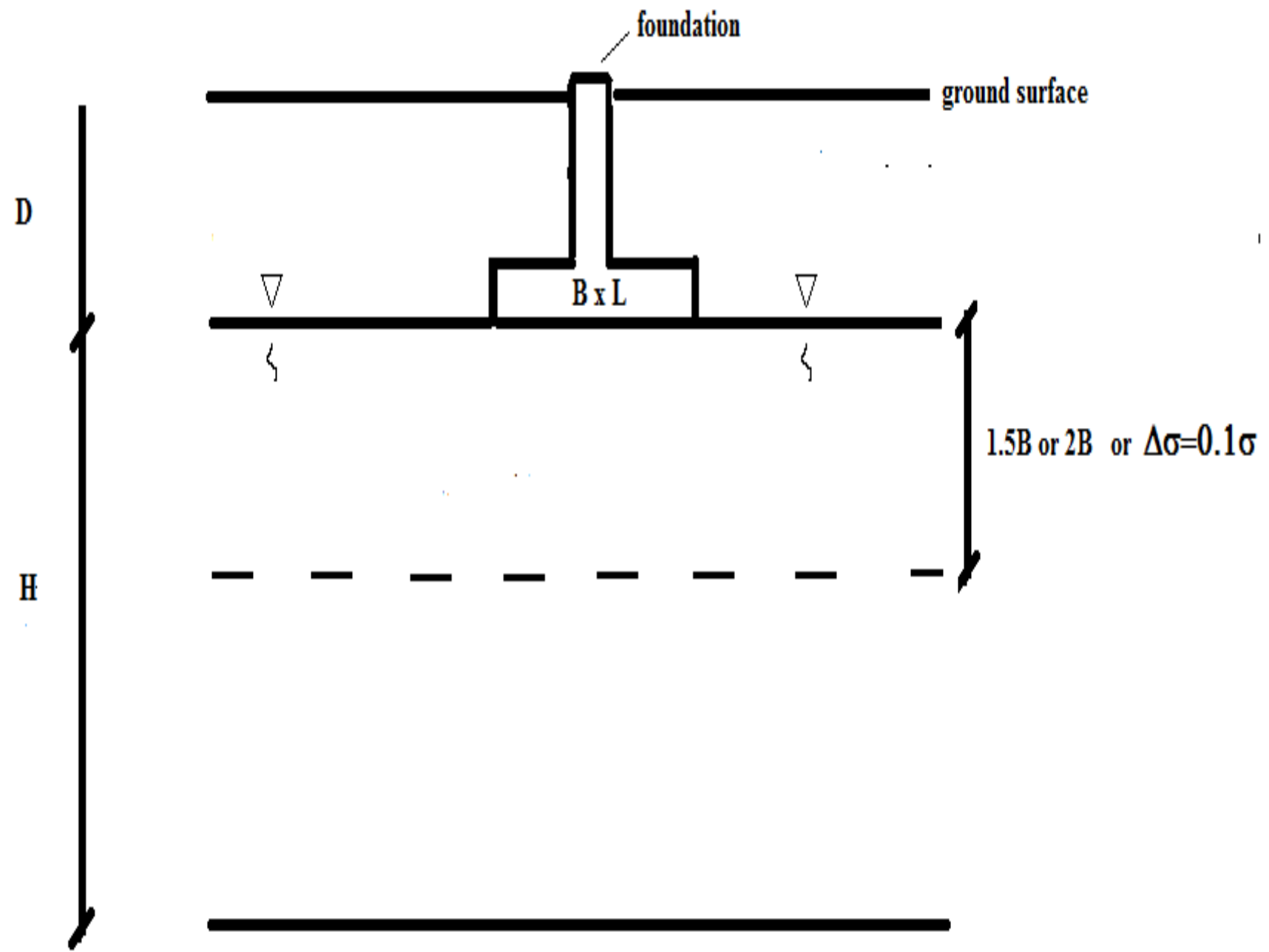
at 1.5m ; [$\gamma = 16.7 \text{ kN/m}^3$, $C_N = (100/25)^{1/2}$; $C_E = 0.8$]

$$N = 4 = N_{30} \quad N_1 = 7 \quad N_{60} = 3 \quad N_{1,60} = 5$$

A square foundation (3mx3m) is to be constructed in a site. The depth of foundation will be 1.5 m below the ground surface. The SPT N values obtained were presented below.

- a)calculate c_u ($PI > 20\%$)
- b)calculate ϕ if the soil is sand

Depth (m)	N for 1. 15cm	N for 2. 15 cm	N for 3.15 cm	SPTN
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6.0	7	8	10	18



.SPT $N=44$

.SPT $N_{ave}=44/4=11$

. $c_u=5N= 55\text{kPa}$

$\phi=53.881-27.6034e^{-0.0147*11}= 30^\circ$