Example 1

A pile with L = 65', x-section = 18"×18" is embedded in sand with $\phi = 30°$, $\gamma = 118.3$ pcf. Estimate point bearing resistance.

Solution (Meyerhof)

Example 2

Timber piles, 25' log with 10" point diameter, were driven through a silty sand with $\phi = 25°$ into undrelying dense sandy gravel with $\phi = 40°$. Penetration into the sandy gravel was 3'. Determine point bearing capacity of a pile.

Solution

Example 3

A 12 m prestressed concrete pile 450 mm square is installed in a clay with water table at 5 m depth. Upper clay layer is 5 m thick, with $\gamma = 17.4$ kN/m^3 and $c_u = 50$ kPa. Lower clay has $\gamma = 18.1$ kN/m^3, $c_u = 75$ kPa. Determine pile capacity using λ - method.

α-method

$f = F \cdot \alpha \cdot c_u$

α = adhesion factor

F = length factor

$\frac{c_u}{\sigma_o'} = \frac{\text{undrained shear strength}}{\text{effective overburden stress}}$

α for rigid piles

$\frac{c_u}{\sigma_o'}$	α
0 to 0.35	1.0
0.35 to 0.8	[1]1.0 - 0.5
0.8 to 3.2	0.5

[1] *α decreases linearly*

Example 4. Redo using α - method

Solution

Example 5. Redo the Example 3 assuming 200 mm pipe

Solution

Dynamic Formulae

Based on Newton's impact relationships which apply to two free massive bodies.

Ram is massive. Pile ?

A blow of Hammer produces:

1. Permanent penetration of pile called ‘set’

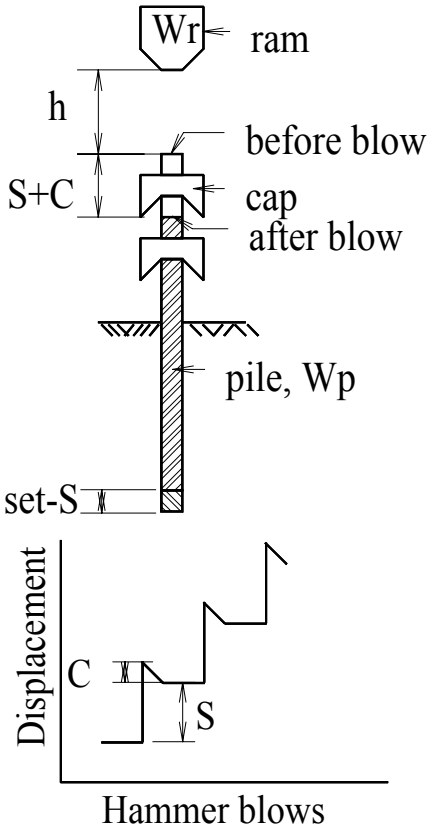
2. Elastic compression of:

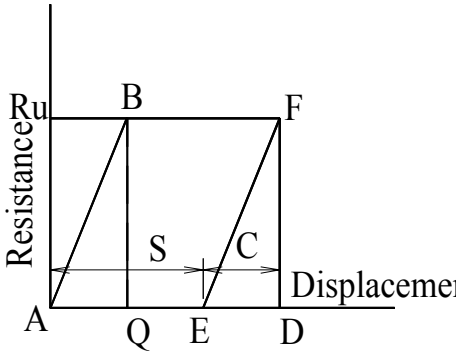
a) head assembly

b) pile

c) surrounding soil

Total work = work for driving pile + losses





Q - displacement called quake
where resistance reaches Ru

Total work = area ABFD = ABFE + DEF

ABFE - is the set, DEF - is the elastic compression of cap block, pile, and soil.

$$W_r h = R_u\left(S + \frac{1}{2}C\right)$$

Ultimate resistance R_u is

Wellington, 1888[1].

$$R_u = \frac{W_r h}{S + \frac{1}{2}C}$$

[1] *This formula was developed based on timber piles*

Example 6

Draw number of blows per inch versus R_u for the following conditions using EN formula, modified Engineering News formula, and Janbu formula. Steel HP10×57, coefficient of restitution (n) = 0.8, efficiency (E) = 0.85, Vulcan 08 hammer. C = 0.1". [1]Use two pile lengths 20' and 80'. Elastic modulus = 29×10^3 ksi

Solution

[1] *For plotting graphs assume several R_u and compute set*