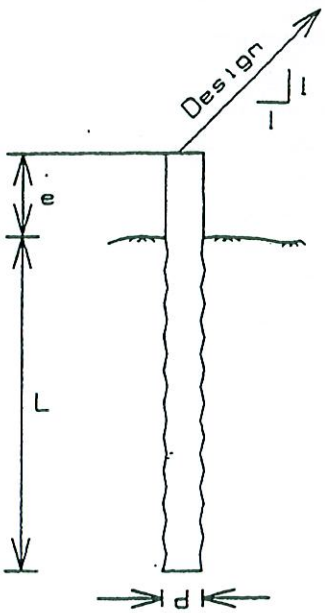
yield moment of the pile is less than the ultimate lateral soil resistance.

The maximum safe single use working load for free headed piles in cohesionless soils may be taken as one-half of the ultimate load values.

EXAMPLE PROBLEM, LATERAL LOADING IN COHESIONLESS SOIL



Design = 3,800 Lbs
H = 2,687 Lbs
V = 2,687 Lbs

$\phi = 30°$
$\gamma_s = 110$ pcf
$\gamma_c = 145$ pcf
L = 8'-0"
pile d = 1'-6"
e = 2'-0"

Single use loading

Solution:

$K_p = \tan^2(45° + \frac{\phi}{2}) = 3.00$ (for level ground surface)

L/d = 5.33 | e/d = 1.33

From Figure 3:

$$\frac{H_{ULT}}{K_p \gamma d^3} \approx 5 \quad \text{when } e = 2'\text{-}0"$$

$H_{ULT} = K_p \gamma d^3 (5) = (3.0)(110)(1.5)^3(5) = 5{,}569$ Lbs

Working Load Value for H = $\frac{5{,}569}{2}$ = 2,784

Compute f_g and M_{ULT}:

$$f_g = \left[\frac{H_{ULT}}{1.5\gamma_s d K_p}\right]^{1/2} = \left[\frac{5,569}{1.5(110)(1.5)(3.0)}\right]^{1/2} = 2.74 \text{ feet}$$

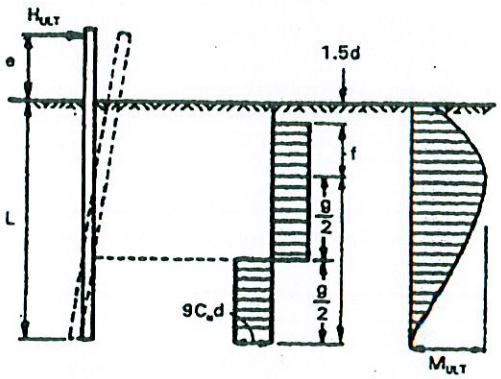
$$M_{ULT} = H_{ULT}\left[e + \frac{2f_g}{3}\right] = 5,569\left[2 + \frac{(2)(2.74)}{3}\right] = 21,311 \text{ Ft-Lb}$$

Working Load Value for M = $\frac{21,311}{2}$ = 10,656 Ft-Lbs

LATERAL LOADING IN COHESIVE SOILS

The ultimate soil resistance for piles in cohesive soils increases to some maximum value at approximately 3 pile diameters below the ground surface then remains fairly constant at greater depth. Literature suggests using a soil distribution of zero between ground surface and a depth of 1.5 times the pile diameter (1.5d) and then using a value of 9 times the undrained shear strength $(9C_u)$ for the remainder of the pile depth.

SHORT PILE



LONG PILE

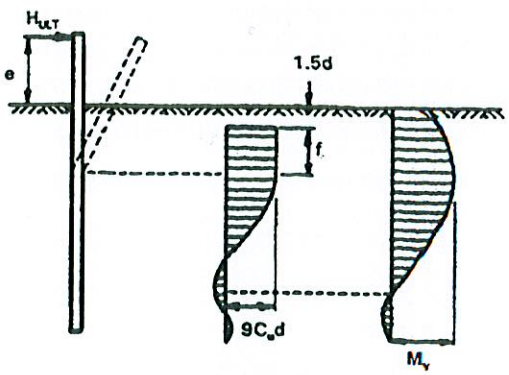


FIGURE 5

Figure 5 depicts soil pressure diagrams for short and for long piles in cohesive soils. Short piles have a limiting embedment