Problème 5.1

* Méthode de Meyerhof

* Pieu carré en béton

* Battage

(a) <u>Capacité en pointe</u>

$Q_P = m \times N \times A_P$

$Q_P = 400 \times 38 \times (0.3 \times 0.3)$

$\underline{Q_P = 1368kN}$

<u>Capacité en friction</u>

$Q_F = n \times \overline{N} \times D \times A_S$

$Q_F = 2 \times 27 \times 15 \times (4 \times 0.3)$

$\underline{Q_F = 972kN}$

$Q_{ult} = Q_P + Q_F = 2340kN$

$$Q_{adm} = \frac{Q_{ult}}{F.S.} = \frac{2340}{4} = 585kN$$

(b) <u>Tassement d'un seul pieu</u>

$$Aire = 30cm \times 30cm = \frac{\pi}{4} D_{éq}^2$$

$D_{éq} = 33.85cm$

$$S_{1\,pieu} = \frac{D}{100} + \delta$$

$$S_{1\,pieu} = \frac{D}{100} + \frac{100\,QL_P}{EA}$$

$$S_{1\,pieu} = \frac{33.85}{100} + \frac{100 \times 585 \times 15}{(0.3)^2 \times \sqrt{30 \times 10^6} \times 5000} = 0.695cm \approx 0.7cm$$

(c) On vérifie d'abord l'espacement entre les pieux :

$4m = 0.3m + 3S_H \Rightarrow S_H = 1.233m = 4.1D$

$3m = 0.3m + 2S_V \Rightarrow S_V = 1.35m = 4.5D$

$\therefore$ On peut assumer que les pieux travaillent en groupe.

$$Q_{ult\ g} = Q_{ult\ s} \times N^o\ des\ pieux$$

$$Q_{ult\ g} = 2340 \times 12 = 28080\ kN$$

$$Q_{adm\ g} = \frac{Q_{ult\ g}}{F.S.} = \frac{28080}{4} = 7020\ kN\ (ou\ simplement\ Q_{adm\ g} = 12 \times Q_{adm\ s})$$

$$S_g = S_s\sqrt{\frac{B}{b}} = 0.7\sqrt{\frac{3}{0.3385}} = 2.084cm$$

Problème 5.2

* Bois

* Circulaire, D=0.3m

* F.S. de charge =3.0

* Q_{adm}=200kN

(a) <u>Capacité en pointe</u> (pour D<0.5m, N_c=9)

$$Q_P = N_c \times c_u \times A_P$$

$$Q_P = 9 \times 60 \times \frac{\pi}{4}(0.3)^2$$

$$\underline{Q_P = 38.17kN}$$

<u>Capacité en friction</u>

$$Q_F = \alpha \times c_u \times A_S = (\alpha \times c_u)_1 A_{S1} + (\alpha \times c_u)_2 A_{S2}$$

$$Q_F = 37 \times \pi(0.3) \times 8 + 46 \times \pi(0.3) \times L_2$$

$$Q_F = 278.973 + 43.354 L_2$$

$$Q_{adm} = \frac{Q_P + Q_F}{F.S.} = 200kN$$

$$200 \times 3 = 38.17 + 278.973 + 43.354 L_2$$

$$L_2 = 6.524m$$

$$L = 8 + 6.524 = 14.524m \qquad soit\ L = 14.60m$$

Problème 5.3

* Pieu foré

* D=0.3m

(a) Capacité en pointe

$Q_P = m \times N \times A_P$

$Q_P = 120 \times 45 \times \frac{\pi}{4}(0.3)^2$

$\underline{Q_P = 381.704kN}$

Capacité en friction

$Q_F = n \times \overline{N} \times D \times A_S$

$Q_F = 1 \times 15 \times 10 \times (\pi \times 0.3)$

$\underline{Q_F = 141.372kN}$

$Q_{ult} = Q_P + Q_F = 523.075kN$

$Q_{adm} = \frac{Q_{ult}}{F.S.} = \frac{523.075}{4} = 130.769kN$

Problème 5.4

Formule de Hiley

$$Q_{ult} = \frac{W_r \times h \times e_h}{S + \frac{1}{2}(C_1 + C_2 + C_3)} \times \frac{W_r + n^2 W_p}{W_r + W_p}$$

* W_r= Poids du marteau; Marteau Vulcan 140C double action

Du tableau A-2, $\underline{W_r = 125\ kN}$

* e_h= Efficacité du marteau

$\underline{e_h = 0.78}$

* S= Enfoncement pour un coup (refus)

<u>S=19mm</u>

* $W_r$xh = Énergie (du tableau) =48.8 kN.m

* W_P= Poids du pieu (Pieu tubulaire en acier)

$W_p = \gamma$ x volume =77 (11045x10^{-6} x 16.76)= 14.25 kN

* C_1= 0

* $C_2 = \frac{Q_{ult} \times 16.76 \times 10^3}{11045 \times 10^{-6} \times 2 \times 10^8}$

* C_3= 2.5

* n= 0.5

$$Q_{ult} = \frac{48.8 \times 10^3 \times 0.78}{19 + 0.5\left(0 + \frac{16.76 Q_{ult}}{2209} + 2.5\right)} \times \frac{125 + 0.5^2 \times 14.25}{125 + 14.25}$$

$$Q_{ult} = \frac{38064}{20.25 + 3.794 \times 10^{-3} Q_{ult}} \times 0.923$$

$$Q_{ult} = \frac{35142.57}{20.25 + 3.794 \times 10^{-3} Q_{ult}}$$

$$3.794{Q_{ult}}^2 + 20.25 \times 10^3 Q_{ult} - 35142.57 \times 10^3 = 0$$

$$Q_{ult} \approx 1379\ kN$$

$$Q_{adm} = \frac{Q_{ult}}{4} = 344.75\ kN$$