GEOTECHNICAL DESIGN OF DRIVEN PILES UNDER AXIAL LOADS

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1 Settlement of Piled-Raft System with floating piles

If concrete columns are not end bearing, the settlement may become an issue. The settlement of concrete column-reinforced soft foundations can be estimated using the method for piled rafts or pile groups.Horikoshi and Randolph (1999) and Poulos (2001) proposed simplified design methods to calculate the settlement of piled rafts, which are based on pile–raft interaction.

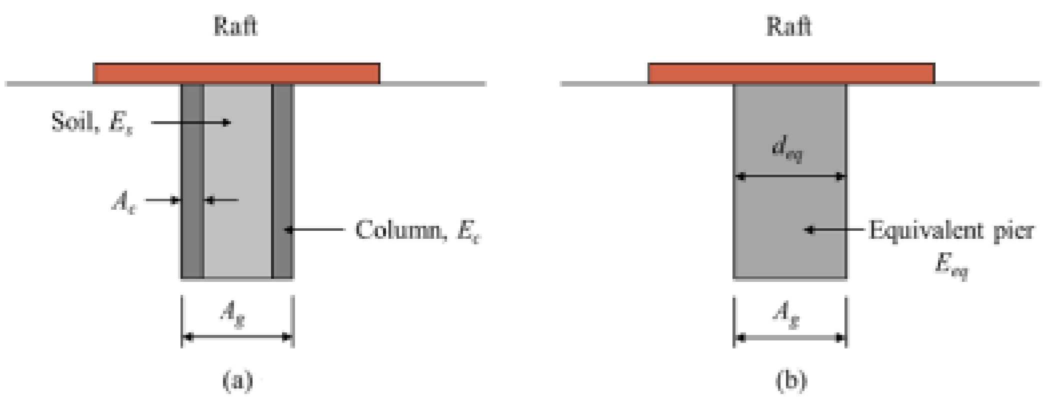

Figure 1: Equivalent Pier

Randolph (1999) used the equivalent pier concept for the piled raft method as shown in 1.Independent parameters that are required known before calculation are as follows:

$$
\begin{aligned}
&\text{Material Properties :}\\
E_c &= \text{modulus of Elasticity for pile materials in Mpa}\\
E_s &= \text{modulus of Elasticity for soil in Mpa}\\
\nu &= \text{Poisson's ratio for soil}\\
G_L &= \text{shear modulus of the soil at the base of columns MPa}\\
G_b &= \text{shear modulus of the soil below the base of columns Mpa}\\
G_{avg} &= \text{average shear modulus of the soil within the length of columns Mpa}
\end{aligned}
$$

$$
\begin{aligned}
&\text{column Properties :}\\
N_{cl} &= \text{Number of columns}\\
s &= \text{spacings of column in meter}\\
L_c &= Length of column in meter\\
r_c &= \text{radius of pile}\\
A_{ci} &= \text{Area of ith column in meter}
\end{aligned}
$$

$$
\begin{aligned}
&\text{Raft Properties}\\
L_r &= \text{Length or Diameter of the raft}\\
B_r &= \text{Width or Diameter of the raft}\\
I_s &= \text{Influence Factor 0.88 for square raft or 0.79 for circular raft}
\end{aligned}
$$

2 Calcualtion Steps

Step1:Calcualte Shear Modulus of Soil

$$
\begin{aligned}
G_L &= \text{shear modulus of the soil at the base of columns MPa} \\
G_b &= \text{shear modulus of the soil below the base of columns Mpa} \\
G &= \frac{E}{2(1+\nu)} \\
G_{avg} &= \frac{G_L + G_b}{2} \\
\xi &= \frac{G_L}{G_b} \\
\rho &= \frac{G_{avg}}{G_L}
\end{aligned}
$$

Step2:Radius of Influence

$r_m = Cr_c + \{0.25 + \xi[2.5\rho(1-\nu_s) - 0.25]\}L_c$

$C = 0\text{if } \mathrm{L}_{c\frac{}{r_c>5\text{if } \mathrm{L}_{c\frac{}{r_c>5\text{if } \mathrm{L}_{c\frac{}{r_c>5\text{if } \mathrm{L}_{c\frac{}{r_c>5}}}}}}}}$ $G_L = \text{shear modulus of the soil at the base of column}$