SEISMIC BEARING CAPACITY OF SHALLOW FOUNDATION WITH BASE INCLINATION

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The seismic bearing capacity for strip footings with base inclination is the aim of this paper. For this purpose, a limit equilibrium based method is used. The seismic force considered as pseudo-static forces acting on both footing and soil is determined. To obtain the ultimate bearing capacity, an imaginary retaining wall is assumed to pass the footing wedge and the lateral earth pressure exerted on the wall in active and passive conditions are determined. The bearing capacity factors are computed for various values of soil friction angle, seismic acceleration coefficients in horizontal and vertical directions, ground inclination, distance of the foundation from the slope edge. The effects of various parameters on seismic bearing capacity factors have been studied. The results obtained from the present method are compared with other available methods.

Some researchers including Sarma and Iossifelis (1990), Budhu and Al-Karni (1993), Richards et al. (1993), Paolucci and Pecker (1997), Soubra (1999), Kumar and Rao (2002), and Choudhury and Subba Rao (2005) have studied the seismic bearing capacity of shallow footings for the horizontal ground. However, for sloping ground, data are very limited. Sarma (1999) and Askari and Farzaneh (2003) have presented solutions for seismic bearing capacity of shallow foundations near sloping ground. Recently, Choundhury and Rao (2006) carried out the analysis for seismic bearing capacity factors of footings construced on slopes. It is noted that this method was initially developed by Richards et al. (1993) for footings on homogeneous granular soil and extended to two layered granular soil by Ghazavi and Eghbali (2008), and Ghazavi and Salmani (2012) for frictional-cohesive soil. Salmani and Ghazavi (2013) have extended the imaginary retaining wall method for foundation base inclination.

This paper presents a simple method for determination of the seismic bearing capacity of strip footings with base inclination on granular soils. For this purpose, an imaginary retaining wall is assumed in the vertical direction along the edge of the footing (Figure 1). The lateral earth pressures exerted on the wall in active and passive conditions are determined. The conventional bearing capacity factors are extracted and then the bearing capacity equation is derived.

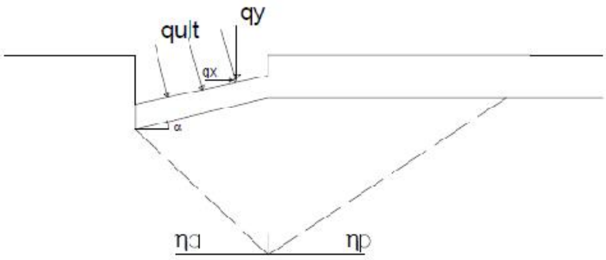

Figure 1. Failure mechanism and wedges assumed in present model

The ultimate bearing capacity may be obtained by present equation:

$$qult = \frac{1}{2}\gamma h^2 cos\delta \frac{(k_{pe} - k_{ae})}{k_{ae} cos\delta h + Bsin\alpha} + qcos\delta h \frac{k_{pe}}{k_{ae} cos\delta h + Bsin\alpha} \quad (1)$$

The bearing capacity factors may be obtained from Eq. (2 , 3) as:

$$N_{qe} = \frac{k_{pe} cos\delta tan\eta_{ae} cos\alpha}{k_{ae} cos\delta tan\eta_{ae} cos\alpha + sin\alpha} \quad (2)$$

$$N_{\gamma e} = \frac{(k_{pe} - k_{ae}) cos\delta (tan\eta_{ae} cos\alpha)^2}{k_{ae} cos\delta tan\eta_{ae} cos\alpha + sin\alpha} \quad (3)$$

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