

Example 2.2 Pad foundation with inclined eccentric load on boulder clay

The square pad foundation shown in Figure 2.2a, with an embedment depth of 0.8 m, which is below any topsoil and disturbed ground, is required to support the following characteristic loads:

Permanent:	Vertical	$G_{v,k} = 1000$ kN, excluding weight of foundation
	Horizontal	$G_{h,k} = 0$
Variable:	Vertical	$Q_{v,k} = 750$ kN
	Horizontal	$Q_{h,k} = 500$ kN, at 2m above the top of the foundation
Concrete weight density		$\gamma_c = 25$ kN/m ³

The variable loads are independent of each other. Assume the variable loads are repeated several times at this magnitude.

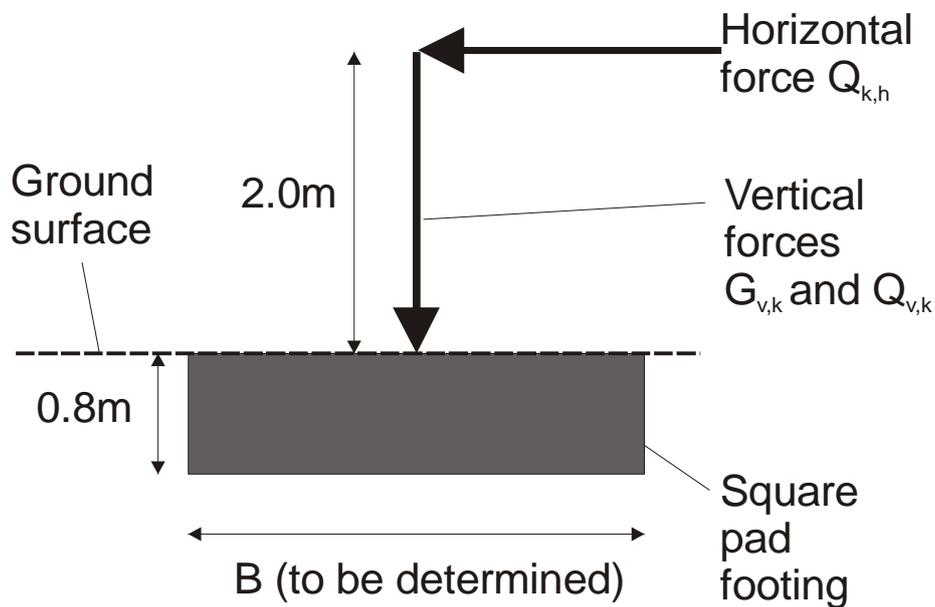


Figure 2.2a: Pad foundation (square on plan)

The soil consists of boulder clay. The soil has a bulk weight density of 21.4 kN/m³ and the ground water level is 1.0 m below the ground level.

Please assume the following benchmark characteristic values apply:

- Characteristic SPT blow count $N_k = 30$ at 1m depth; 35 at 2m; 40 at 4m
- Characteristic undrained strength* $c_{u,k} = 190$ kPa at 1m; 210 kPa at 2m; 240 kPa at 4m
- Characteristic undrained Young's modulus* $E_{u,k} = 150$ MPa at 1m; 170 MPa at 2m; 190 MPa at 4m
(*OR, if a single value is adopted, please use $c_{u,k} = 210$ kPa and $E_{u,k} = 170$ MPa constant with depth)
- Characteristic drained strength $\phi_k = 30^\circ$ and $c'_k = 25$ kPa (constant with depth)
- Characteristic drained Young's modulus $E_{s,k} = 50$ MPa (constant with depth)

Assume the limiting value of settlement is 25 mm and of tilt is 1/500.

The width of the foundation when designed to Eurocode 7 is to be determined, assuming the foundation is for a conventional concrete framed structure. There is no need to consider any effects due to frost or vegetation. The foundations' design working life is 50 years.