

Example 2.1/benchmark: Pad foundation with vertical central load on dense sand

Note: this is a persistent design situation; for simplicity, accidental design situations do NOT need to be checked.

The square pad foundation shown in Figure 2.1a is made from concrete with a weight density of 25 kN/m^3 and has an embedment depth of 0.8 m. The ground surface shown can reliably be assumed to be below any topsoil and disturbed ground.

The foundation is required to support the following characteristic loads:

Permanent:	Vertical	$G_{v,k} = 1000 \text{ kN}$, excluding weight of foundation
	Horizontal	$G_{h,k} = 0$
Variable:	Vertical	$Q_{v,k} = 750 \text{ kN}$
	Horizontal	$Q_{h,k} = 0$

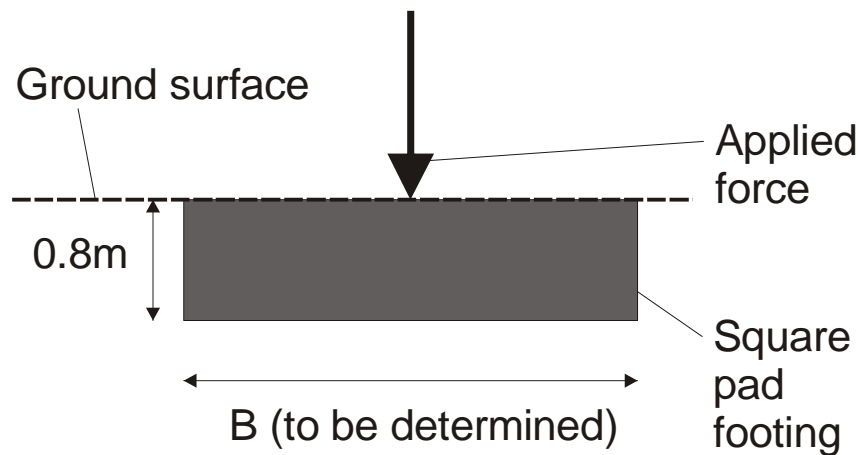


Figure 2.1a: Pad foundation (square on plan)

The soil consists of a very dense fine glacial outwash sand with a mean particle size of 0.14 mm. The soil has a bulk weight density of 20 kN/m^3 and close to 100% relative density. The ground water level is 6 m below ground level. The water content above the water table is 11% and the degree of saturation is 71%. Bedrock underlies the sand at 8m depth.

Please assume the following benchmark characteristic values apply:

- Characteristic cone resistance $q_{c,k} = 13 \text{ MPa}$ constant with depth
- Characteristic angle of shearing resistance $\phi_k = 38 \text{ degrees}$
- Characteristic Young's modulus $E_k = 32.5 \text{ MPa}$ (based on $E = 2.5 q_c$)

The foundation is to be designed to Eurocode 7 to determine the foundation width when the maximum allowable settlement is 25 mm. There is no need to consider any effects due to frost or vegetation. The foundation's design working life is 50 years.