



The foundation of a bridge pier is to be constructed on the soil profile which consists of two layered clayey soil whose properties are given in table below.

Soil type	Depth (m)	SPT-N	$c_u$ (kPa)	$E_s$ (MPa)	$\gamma$ (kN/m <sup>3</sup> )	K (MN/m <sup>3</sup> )
Stiff clay	0 – 11	8	40	12	18	24
Hard clay	>11	35	175	55	20	100

The loads and the design specifications for this foundation are also listed below.

Loads:

- Total vertical load : 19800 kN (static load)
- Total horizontal load : 4000 kN (EQ load)
- Moment at the base of the pile cap : 36000 kN.m

Design specifications:

- FS = 3.0 (against static load)
- FS = 1.1 (against EQ load)
- Allowable settlement : 40 mm
- Allowable horizontal deflection at pile head : 20 mm

Please design a pile foundation including the diameter, spacing and length of the pile that can support such a structure. Do not forget to design the pile cap (dimensions, depth etc.). You are expected to prepare a ~10 min. presentation and a report of 8-10 pages.