

**CI250 - Soil Mechanics and Engineering Geology**  
**- Geotechnical analysis -**

**Tutorial sheet 1**

1. The strip foundation, shown in Figure 1, is assumed to fail by rotation along the circular slip surface, which passes through one edge of the footing and has its centre vertically above the other edge (i.e. point O). By applying the Limit equilibrium method of analysis show that the critical slip surface has  $\alpha = 67^\circ$  and that the ultimate footing load is given by  $Q = 5.52 B S_u$ . Assume the soil to behave undrained, with a Tresca failure criterion,  $\tau = S_u$ .

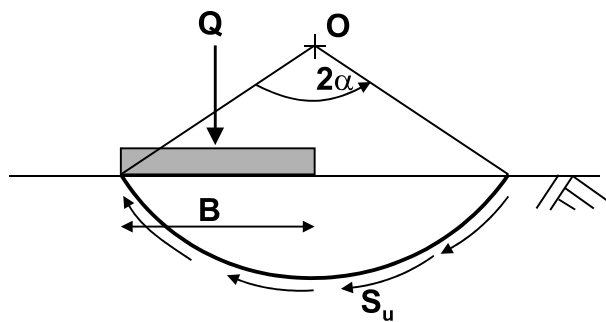


Figure 1

2. A vertical cut, 3.5m deep, is excavated in saturated intact clay. The clay is isotropic and has an undrained strength  $S_u$  and a saturated unit weight of  $19 \text{ kN/m}^3$ . Assuming that vertical, air filled tension crack forms behind the slope crest to a depth of 1.5 m, determine the magnitude of the undrained strength necessary to maintain short term stability. Use a planar failure surface and apply the Limit equilibrium analysis method.

What would the undrained strength have to be if the excavation is filled with water to a depth of 1m above the base of excavation, the tension cracks remaining free of water?