



DESIGN EXAMPLE BASED ON
THE GEOTECHNICAL ENGINEERING
HANDBOOK
(Ernst and Sohn, 2003)
Volume 2 Ground Anchors, Section 2.5

Information

A 5m long fixed anchor (L) of diameter 0.2m (d) achieves an ultimate capacity (T_{ult}) of 1000 kN.

Questions

What capacity can a 10m fixed anchor achieve? What capacity can a 4 unit multiple anchor with 2.5m unit fixed length achieve?

Analysis

Average bond stress, $\tau_{avg} = T_{ult}/\pi d.L = \underline{318 \text{ kPa}}$

Efficiency factor, $f_{eff} = 1.6L^{-0.57}$

For L = 5m $f_{eff} = 0.64$

Ultimate bond stress for short fixed, $\tau_{ult} = \tau_{avg}/f_{eff} = 318/0.64$
Length not subjected to debonding $\tau_{ult} = \underline{497 \text{ kPa}}$

5m Design for 10m fixed length Conventional Anchor

$\tau_{avg} = \tau_{ult} \times f_{eff}$ For L = 10m $f_{eff} = 0.43$

$\tau_{avg} = 497 \times 0.43 = 214 \text{ kPa}$

Capacity of 10m Anchor: $T_{ult} = \pi \times 0.2 \times 10 \times 214 = \underline{1345 \text{ kN}}$

Design for 10m fixed length Multiple Anchor

Use 4 No 2.5m unit fixed length anchors

For L = 2.5m $f_{eff} = 0.95$ $\tau_{avg} = 497 \times 0.95 = 472 \text{ kPa}$

Capacity per 2.5m Unit Anchor

$t_{ult} = \pi \times 0.2 \times 2.5 \times 472 = 741 \text{ kN};$

Capacity of 4 unit anchors in a 10m fixed length

$$T_{ult} = 4 \times 741 = \underline{\underline{2964 \text{ kN}}}$$