

Bearing Capacity

Civil Engineering

Why ground under a footing fails.

A footing fails when the ground shears; allowable pressure is the failure pressure divided by a factor of safety.

$$q_u = cN_c + \gamma DN_q + 0.5\gamma BN_\gamma \cdot q_a = q_u / F$$

Undrained clay, strip

The $\phi_u = 0$ case.

$$q_u \approx 5.14c_u + \gamma D$$

Usual factor of safety

Codes differ.

Around 3 on gross q_u

Wider footing on sand

Settlement wins.

More capacity, more settlement

THE COMMON MISTAKE

✗ **Sizing on bearing capacity alone**

✓ **Check settlement as well**

On sand and stiff clay, tolerable settlement usually sets the allowable pressure rather than shear failure. A footing can be safe and still move too much.

Educational reference. No rule of thumb justifies a foundation. Design needs ground investigation, a code and an engineer.