Shallow Foundations

Ultimate Bearing Capacity

☒ Shallow foundation

- Spread footing
- Combined
- Continuous
- Mat foundation

☒ Deep Foundation

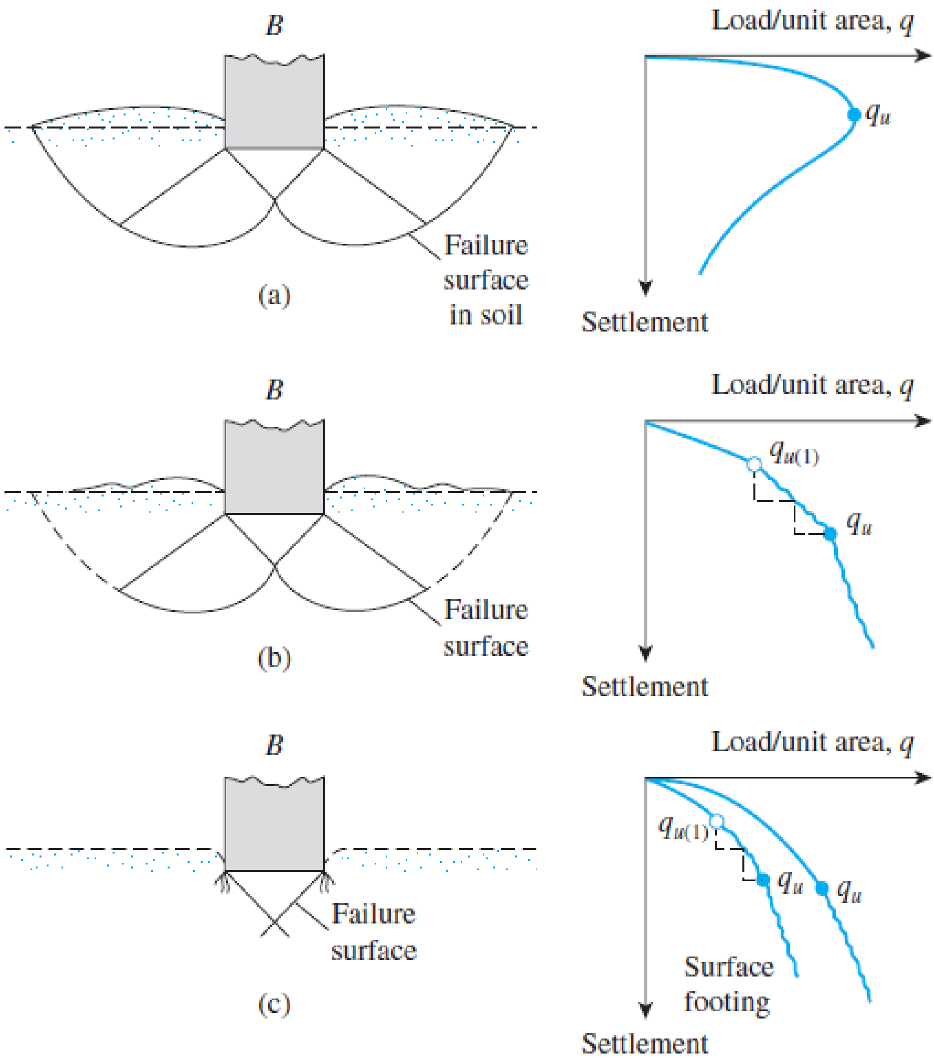
- Piles
- Piers
- Caissons

Requirements for stable foundation

1. Must be properly located with respect to any future influence which could adversely affect its performance
2. Must be safe against failure
3. Must not stele or deflect sufficiently to damage the structure.

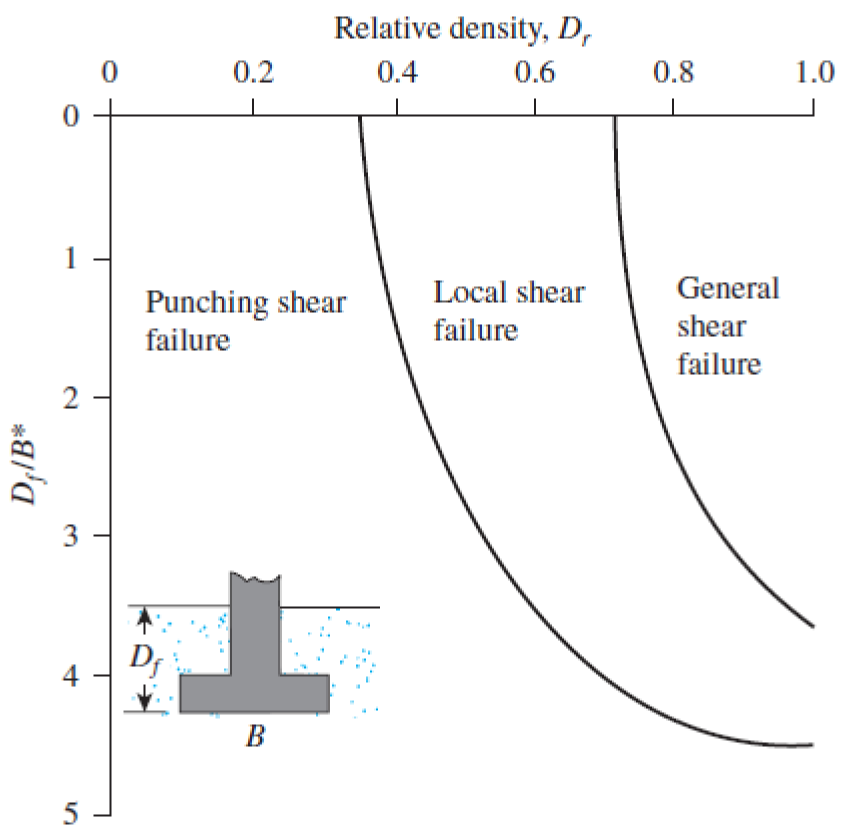
Bearing Capacity of Soil is the capability of soil to support load without shear failure.

- **Modes of failure**

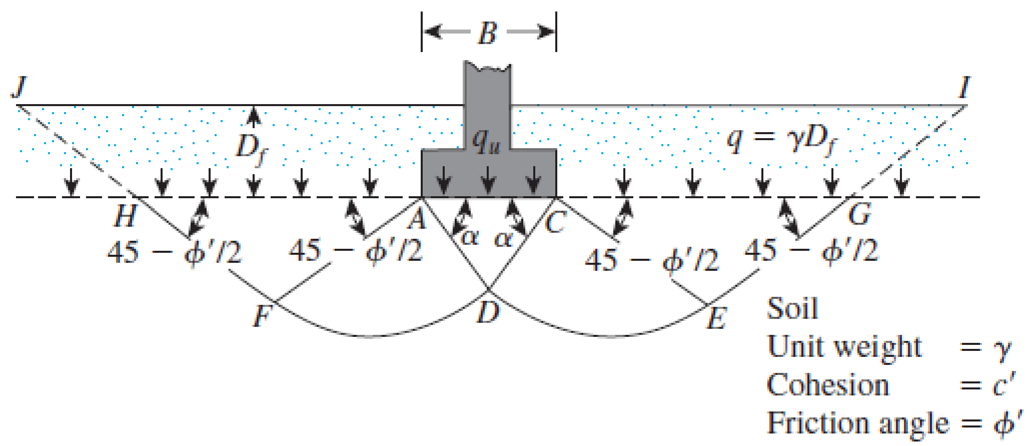


(a) General shear failure (b) local shear failure (c) punching shear failure

- The nature of failure in soil is function of $\left(D_r , \frac{D_f}{B} , \frac{B}{L} \right)$. This function can be illustrated as shown in figure below (Vesic, 1963)



- **Terzaghi's Bearing Capacity Theory**



$$q_u = c'N_c + qN_q + \tfrac{1}{2}\gamma B N_\gamma \qquad \text{(continuous or strip foundation)}$$

Modification of Bearing Capacity Equations for Water Table

Case I. If the water table is located so that $0 \le D_1 \le D_f$, the factor q in the bearing capacity equations takes the form

$$q = \text{effective surcharge} = D_1\gamma + D_2(\gamma_{sat} - \gamma_w) \qquad (3.16)$$

where

γ_{sat} = saturated unit weight of soil
γ_w = unit weight of water

Also, the value of γ in the last term of the equations has to be replaced by $\gamma' = \gamma_{sat} - \gamma_w$.

Case II. For a water table located so that $0 \le d \le B$,

$$q = \gamma D_f \qquad (3.17)$$

In this case, the factor γ in the last term of the bearing capacity equations must be replaced by the factor

$$\bar{\gamma} = \gamma' + \frac{d}{B}(\gamma - \gamma') \qquad (3.18)$$