

What are Foundation Types?

Worksheet

Foundation types are structures that transfer building loads to supporting soil or rock. Shallow foundations (footings, mats) work in firm soil <3 m deep; deep foundations (piles, caissons) are used for weak soil, large depths, or heavy loads.

Questions

1. Depth limit for shallow foundation generally:

- A) < 1 m
- B) < 3 m
- C) < 5 m
- D) < 10 m

2. Piles resist load mainly by:

- A) Bearing at toe only
- B) Friction along shaft and bearing at toe
- C) Buoyancy
- D) Reinforcement tensile strength only

3. Why raft foundation on compressible soil?

- A) Reduces total settlement
- B) Reduces differential settlement
- C) Cheaper than piles
- D) Easier to waterproof

4. Soft clay, bearing capacity 50 kPa. Better foundation:

- A) Large isolated footings
- B) Small isolated footings
- C) Raft or piles
- D) Shallow continuous strip

5. A 5-story office building on firm clay soil (bearing capacity 150 kPa). Which foundation type?

6. A tall building (20-story) on soft clay with bearing capacity 50 kPa. Shallow footing feasible?

7. Why is a raft (mat) foundation better than isolated footings on compressible soil?

8. Define: What are foundation types?

9. Define: Shallow vs. deep foundation depth?

10. Define: When to use piles?

Answer Key

1. B) < 3 m - By definition, shallow foundation has depth < 3 m and significant base on soil surface.
2. B) Friction along shaft and bearing at toe - Piles transfer load via friction (friction piles) and/or tip bearing (end-bearing piles).
3. B) Reduces differential settlement - Raft rigidly spans entire building; load spreads evenly uniform settlement.
4. C) Raft or piles - Weak soil needs raft (distributes load) or piles (transfers to deeper layer).
5. Estimated load: ~ 2 MN (2000 kN) per column Required area per column: $A = \text{Load} / q_a = 2000 / 150 = 13.33 \text{ m}^2$ $3.6 \text{ m} \times 3.6 \text{ m}$ footing Firm soil at < 3 m shallow foundation (isolated spread footing) is suitable
6. Load per column: ~ 10 MN Required area: $A = 10,000 / 50 = 200 \text{ m}^2$ $14 \text{ m} \times 14 \text{ m}$ footing Impractically large; weak soil at depth deep foundation (pile group) is necessary
7. Isolated footings: each settles differently differential settlement, cracks Raft: rigid concrete mat spans entire building base redistributes load, reduces differential settlement Better on uneven or compressible soil
8. Structures that transfer building loads to supporting soil or rock. Main types: shallow (footings, mats) and deep (piles, caissons).
9. Shallow: $D_f < 3$ m, transfers load at shallow depth. Deep: $D_f > 3$ m, transfers load to deeper, more competent layers.
10. Weak/compressible surface soil, deep competent layer, heavy concentrated loads, or riverbank/bridge foundations.

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