

- ① The maximum slope is $3/4 H:1V (53^\circ)$
- ② The size of a soil particle that is smaller than 90% of the soil's grains is referred as the effective grain size (D_{10}).
Effective grain size has been discovered to indicate soil permeability and an indicator for dewatering methods.
- ③
 - Slurry grouting: the soil or rock is injected with a slurry made of water and a grouting agent
 - Chemical grouting: a chemical agent is injected into the rock or soil
 - Compaction grouting: ^{grout} stiff mortar is injected into a soil to compact and strengthen the soil.
 - Jet grouting: by using rotating jet pipe, jet grouting removes the soil from around the grout pipe and replaces it with grout
- ④ A pile's applied load is supported by a combination of end bearing and skin friction. The characteristics of the soil and the type of pile determine the relative contributions of each of these forces.

⑤ Vibratory compaction is the process of densifying cohesionless soil by inserting a vibrating probe into the soil and withdrawing the vibrating probe.

⑥

$$W = 2.5 \quad H = 22 \quad B = \frac{36}{4} = 9 \quad V = 27 \text{ ft}^3 \quad K = 28$$
$$L = \frac{W \cdot H \cdot B \cdot V^{\frac{2}{3}}}{K} = \frac{2.5 \cdot 22 \cdot 9 \cdot 27^{\frac{2}{3}}}{28} = 159 \text{ tons}$$

- ⑦
1. The shell pile is assembled on the ground
 2. The shell pile is hoisted and assembled with both the driving mandrel & pile driver
 3. The shell & mandrel are moved for the desired position for driving
 4. The pile is driven to the required depth. then the mandrel is removed
 5. At the required elevating the top of the shell is burst off
 6. The reinforcing steel is placed into the shell.
 7. Finally, the shell is filled with concrete.

⑧ Spread footings: is the simplest and probably the most common type of building foundation. The capacity is limited by the supporting soil's bearing capacity.

Piles: Building loads are transferred by piles to a more solid & deep soil layer. Their main drawbacks are their price and how long it takes to drive the piles.

Piers: Similar to piles, these transfer building loads to a deeper and more sturdy soil layer. But they need a pier hole to be dug and a reinforced concrete column to be poured. Their price and the length of time needed for construction are their main drawbacks.

⑨

1. Benching the sides of the excavation
2. Shoring the sides of the excavation
3. The use of trench shield around workers