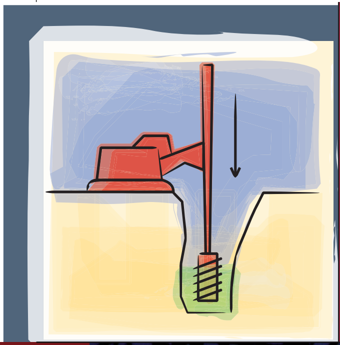


Vibrocompaction

MENARD

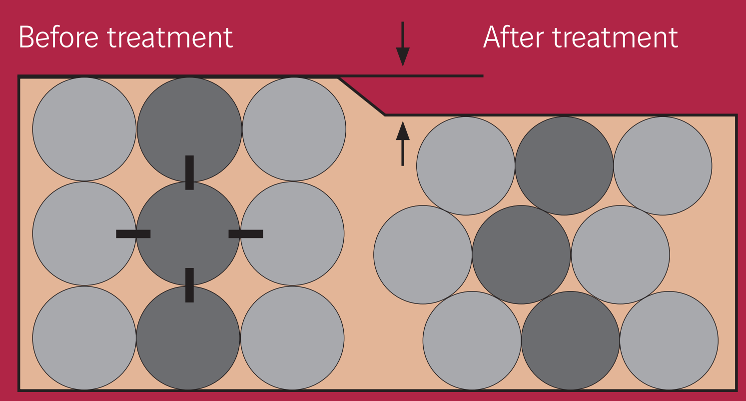
A loose soil or heterogeneous granular backfill can be compacted in depth by the penetration of vibrating probes or vibroflots. The main purpose of vibrocompaction is to densify the in-situ soils by vibration.

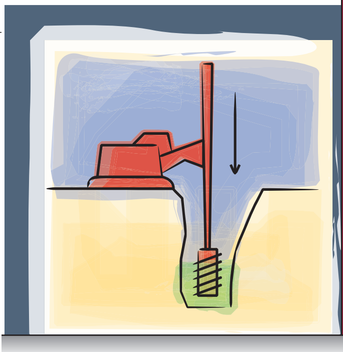
The maintained vibrations associated with a large addition of water through jets along the vibrating probe lead to a localized liquefaction of the soil, allowing the grains to rearrange in a denser state.

The grid of the compaction points depends on the initial characteristics and the criteria to be reached. The design mesh must lead to a treatment of the greatest possible uniformity.

In non-cohesive granular soils, such as sand and gravel, the passage of the vibrating probe causes a liquefaction, and an almost immediate densification and settlement. In cohesive soils, the vibrating probe after withdrawal leaves a hole which must be filled with aggregates.

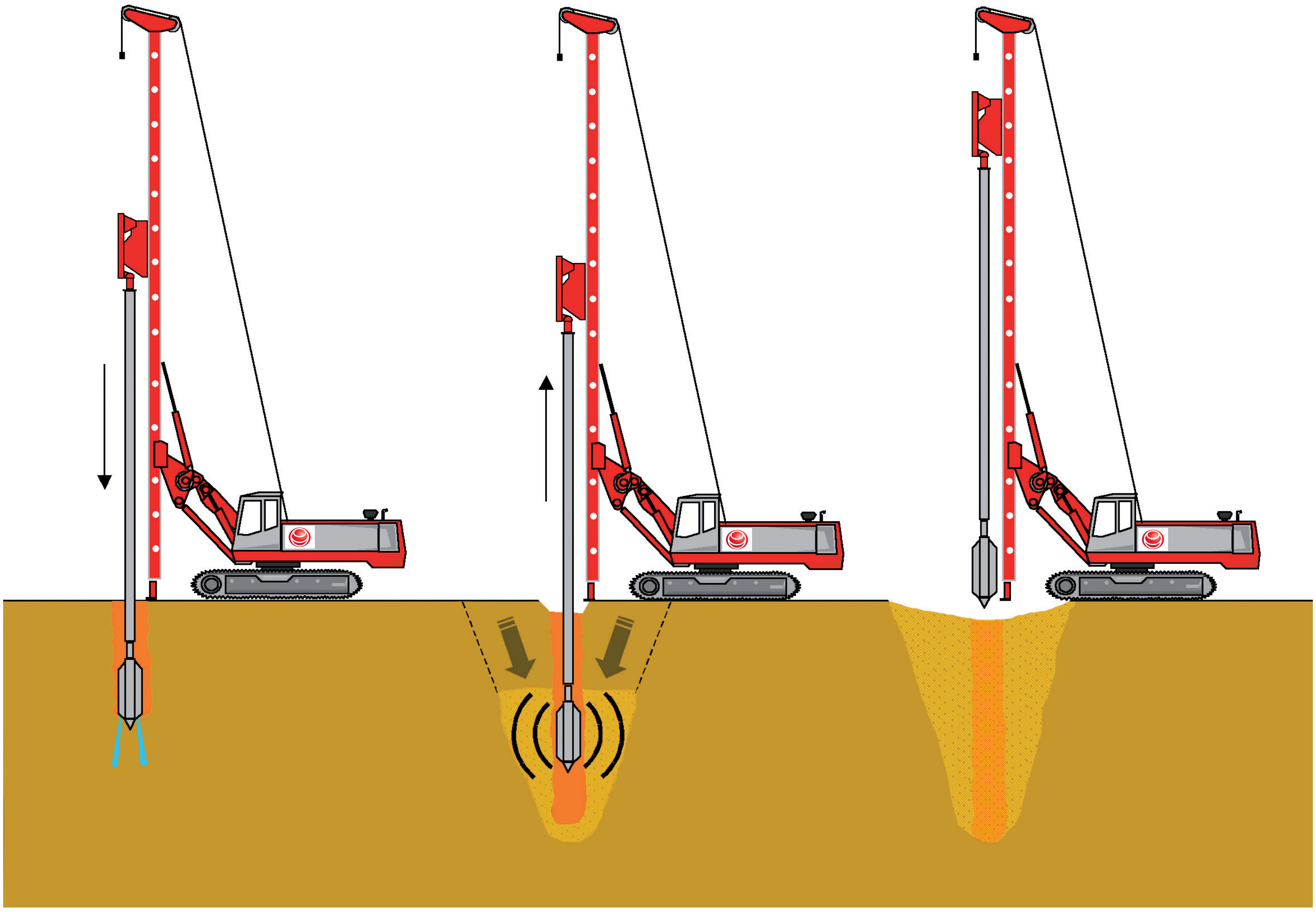
Grains rearranged during compaction





Vibrocompaction

Implementation and methods



Penetration

1) Under the effect of its own weight and the machine's pull down force, the effect of the jetted water and the sustained horizontal vibrations, the vibrating probe rapidly reaches the desired depth. The water jets at the tip are then decreased.

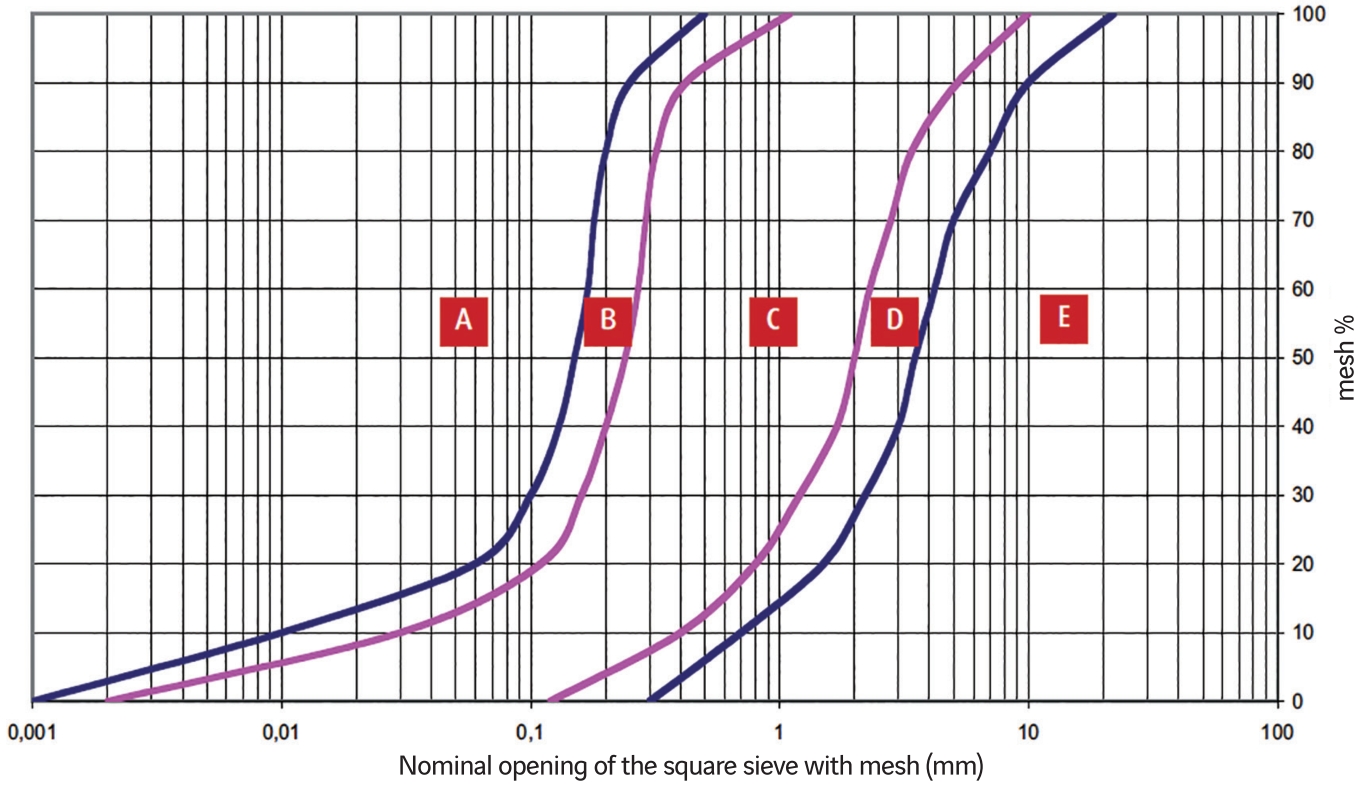
Rearrangement

2) Now the water arrives only through the nozzles at the top of the probe. The obtained cone facilitates the rearrangement of the soil particles. A granular backfill material can also be incorporated from the surface in the created cavity (top feed) . The water flow along the vibrator helps transport the granular backfill material down to the compaction zone at the vibrating probe's base.

Extraction

3) The vibrating probe is gradually lifted in successive passes and produces in this way a cylinder of compacted ground from 2 to 4 meters in diameter depending on the type of soil and vibroflot. The densification of the ground at depths creates at the surface a conical shaped crater, which must be backfilled by additional granular materials as the probe is being removed.

For the ground to be compacted by vibrocompaction, the grain size distribution of the soil must fit within the following grain size curves:



Zone A

These soils cannot be compacted by vibroflotation

Zone B

This zone's soils can be treated by vibroflotation, but the time needed for compaction is relatively long amid the low draining capacity of these soils

Zone C

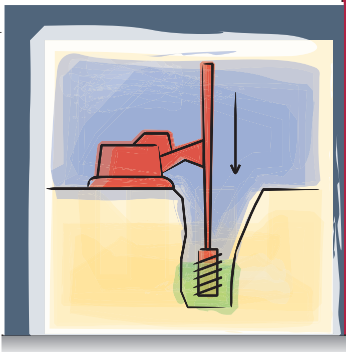
The grain size distribution is ideal for densification by vibroflotation; the fines content is less than 12%

Zone D

These soils have intermediate grain sizes between C and E type soils. Vibroflotation is theoretically applicable, but may raise execution problems

Zone E

These soils are composed of centimeter- and decimeter-sized particles. Even athough, theoretically speaking, these soils are vibrocompactable, vibroflotation is generally not applicable because of false refusal of the probe and the resistance of the larger-size boulders to the penetration of the vibrating probe



Vibrocompaction

Advantages

- The treatment is localized, which allows a customized and optimized treatment of the variousbsoil layers, including at depth;
- Possible treatment to a great depth (> 20 m);
- The treatment by vibrocompaction is only effective starting from 1 to 2 meters in depth because of the lack of vertical confinement at the surface.

Applications

The most common applications are as follows:

- Vibrocompaction is commonly used for antiliquefaction treatment of soils. Vibration compactable grounds correspond in fact quite nicely to the grain size distribution spectra of soils with a strong liquefiable potential;
- Treatment of hydraulic backfill and platforms reclaimed from the sea by dredging;
- Treatment of river or sea banks behind and/or inside caissons or walls;
- In-situ compaction of foundation shafts made of backfill materials.

menard
22 rue Jean Rostand - 91400 Orsay, France
Tel: +33 1 69 01 37 38 www.menard-group.com