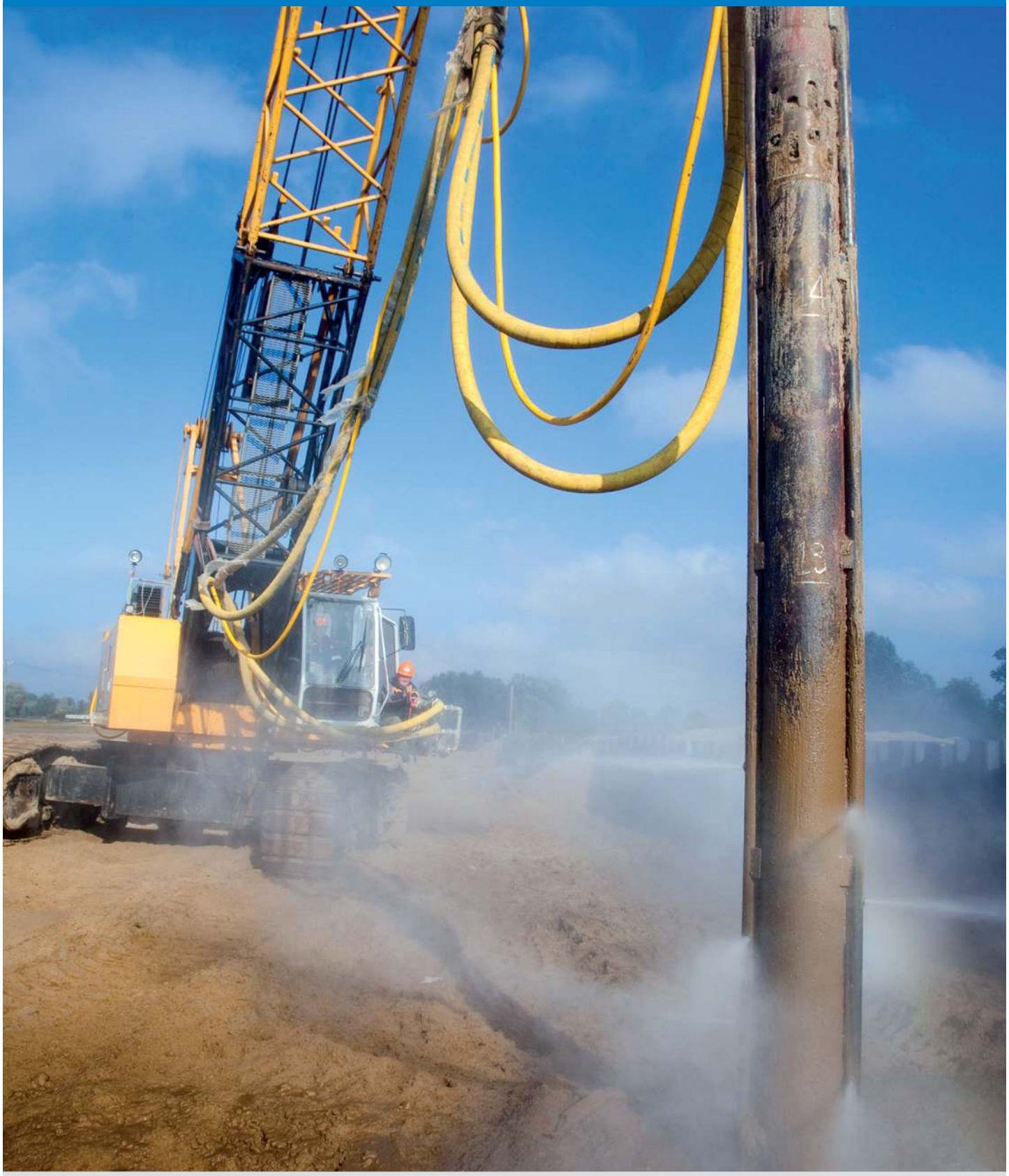
Menard Combined Columns (MCC)



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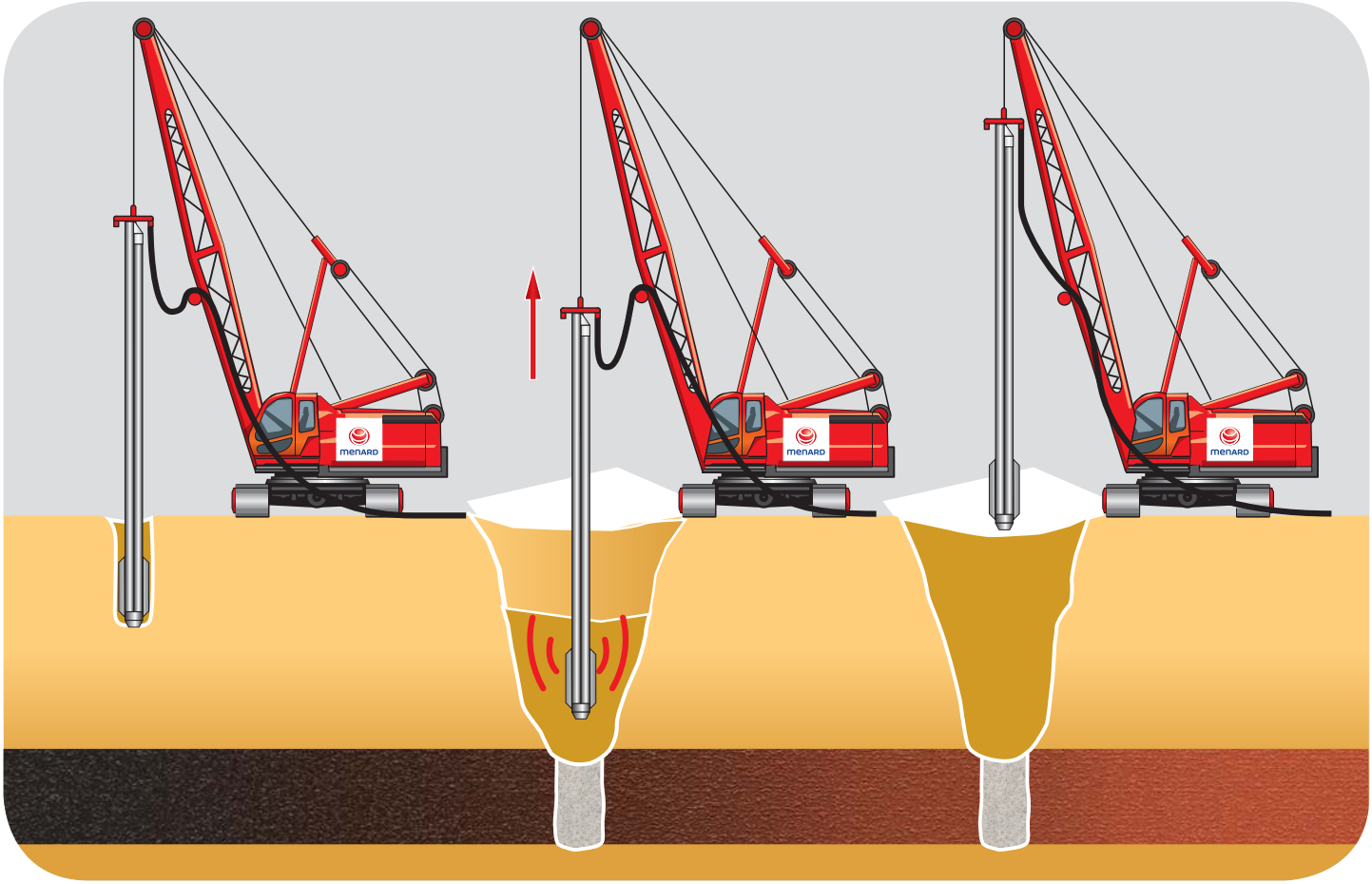
Geological profile in the coastal and old river bed area is often composed of medium bearing soil layers underlain by weak, low bearing layers. The Menard Combined Columns method was designed as a solution for such areas. This special technology significantly enhances soil strength and strain properties, combining advantages of concrete columns where the core of the column is constructed in non-bearing layer and vibroflotation method of compaction where the column is constructed in bearing soil.



Technology specification

Menard Combined Columns are constructed in the following successive stages:

- borehole drilling – depending on the soil properties either vibroflot or other drilling equipment is used (for example CMC displacement bit) which allows drilling by displacement without spoil removal on the surface. The penetration of vibroflot due to the vibration of bit creates cavities.
- cementing – when the tool reaches planned depth cement grout is injected in places where weak organic or cohesive soil is deposited. The load-carrying medium is injected under high pressure through vibroflot nozzles to the previously created well. Cementing process in non-bearing soil is accompanied by the compression of soil through injected cement mixture (grout). When the proper pressure of the grout is reached, the cylindrical head of the vibroflot withdraws at a certain speed.
- compaction – the soil over the weak soil is compacted by vibroflotation.

The Menard Combined Columns technology requires large amounts of water, therefore the project often involves division of land into parcels which are surrounded by dikes (most often 0.5 m in height) in order to control water level.

Before MCC project is started it is necessary to install working platform where heavy equipment can operate.

Application

The application of MCC usually depends on the geological profile, therefore it is recommended to perform in-depth assessment of geological profile before the decision to apply MCC method is made. Columns can be constructed in organic soil (aggradate mud, peat) of moisture content above 100%, cohesive soft soil (loam, silt) and in non-cohesive soil (sand). Columns are often used to reinforce road embankments or other infrastructure objects, but can be also applied as a support for foundations of large enclosed facilities (buildings and halls).

Depending on the soil parameters (especially side resistance of weak soil) and concrete mix (grout) pressure, columns size varies between 0.4 to 1.2 m. However, in case of non-bearing soil, the columns are larger in diameter than in bearing soil. MCC columns are located in rectangular or triangular grid (pattern) of side length from 2.0 m to 4.5 m up to even 25.0 m.
MCC columns are suitable for transferring horizontal loads and moments as column reinforcement in this case is required (e.g. by installing steel sections).

Completed projects

Enclosed buildings:

Residential buildings, office buildings:

- Samoëns/Bonneville office building, France, approx. 1,080 running meters

Infrastructure:

Road and rail embankments:

- Sucharski road, Task No. II, Gdańsk, approx. 41,000 running meters

Advantages:

- **High performance** – MCC is a highly efficient method as it allows to construct hundreds of meters of column per day (during a single work shift).
- **Effective combination** – MCC columns combine advantages of vibroflotation and concrete columns. The method does not over-stiffen nor poses the threat of column washout in organic soil.
- **Tailored to soil condition** – MCC is designed for places where average quality soil is underlain by non-bearing, weak soil requiring improvement.
- **Cost-effectiveness** – concrete core of the column is installed only in non-bearing soil layers, which significantly reduces material consumption as compared to other soil improvement technologies.
- **Comprehensive improvement** – the improvement of mechanical properties of the soil between the columns, while forming the column by swelling / compacting the soil.

Menard Polska Sp. z o.o.
Powązkowska 44c
01-797 Warszawa

biuro@menard.pl
tel.: +48 22 560 03 00, fax: +48 22 560 03 01