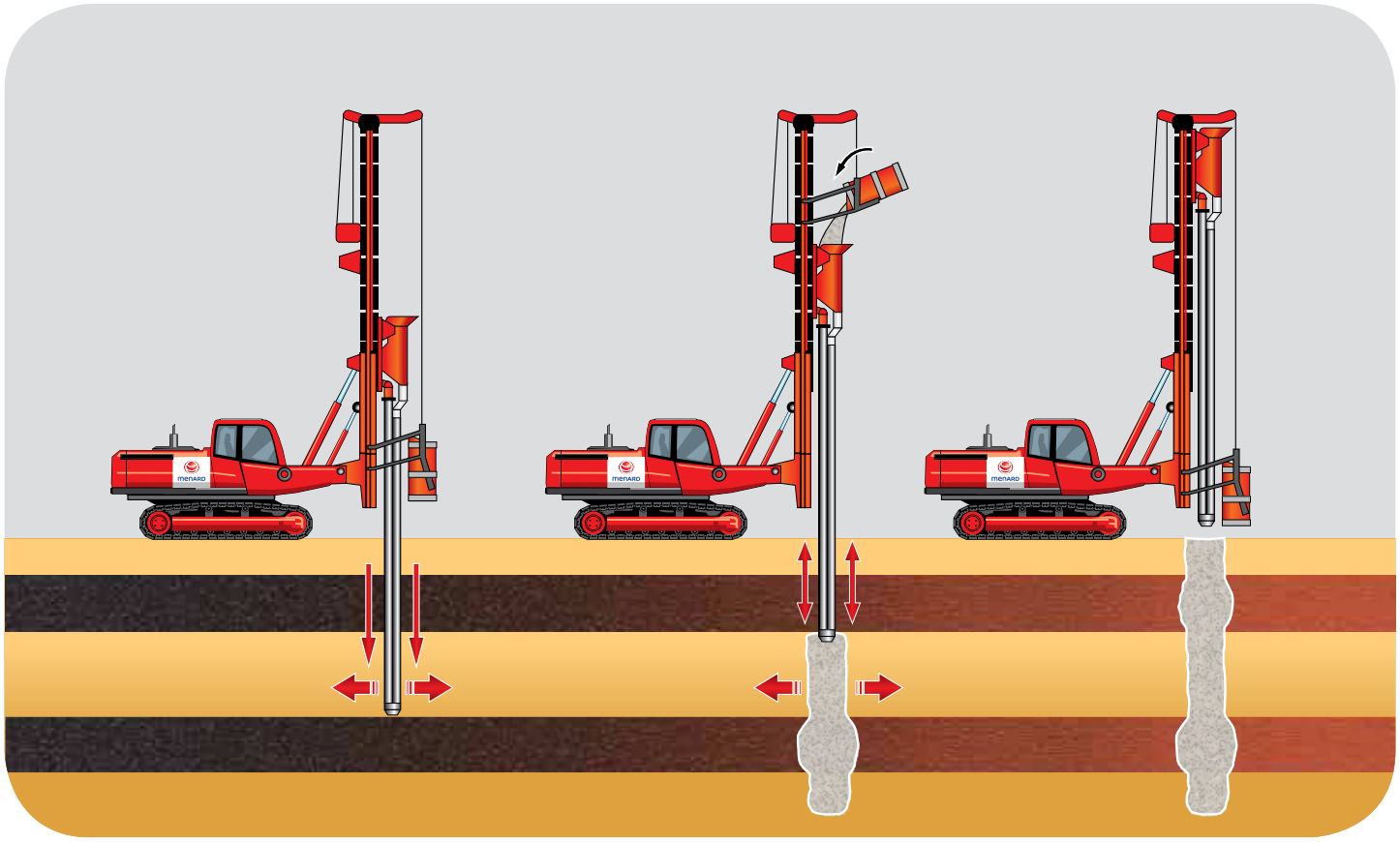
Stone Columns (SC)

menard

ground improvement specialists

The Stone Column technology is one of the best known technology for improvement of the subsoil. The popularity of this method resulted in its widespread use – today the vibro replacement/stone columns are made with various methods with the use of different equipment units depending on the depth and diameter of the columns and parameters of the soil to be improved.



Technology specification

The Stone Columns are formed by inserting a vibroprobe mounted on the equipment unit. Depending on the depth of the columns the following units are used: an excavator (maximum length of the columns is 7.0 m), a rig (maximum length of the columns is 20.0 m) or a crawler crane (maximum length of the column is 40.0 m).

The vibro replacement technology has three main stages, i.e.:

- vibroprobe inserting – its inserting into the ground up to the design depth, the process is often assisted by injecting compressed air, water or air-water mix
- aggregate backfill – the space formed during the first stage is filled with aggregate
- compaction – the process is performed in stages by adding the delivered aggregate every 0.5 m

To form Stone Columns non-uniform natural aggregate such as gravel, sandy gravel and crushed-stone aggregate with the silt fraction below 5% should be used. Depending on the applied method aggregate is supplied via a feeding pipe connected to the vibroprobe (dry bottom feed) or from the level of the working platform along the vibroflot (wet top feed).

Stone Columns formed by electrical or hydraulic vibroflot are 40 to 120 cm in diameter with average efficiency of 200 linear meters per shift.

Application

This technology is well suited for the improvement of firm and soft soils (silts, sandy silts, loams and non-homogeneous soils) as well as non-cohesive soils where additional graining is needed.
The application of this technology to 'young' organic soils may result in washouts or buckling of the columns. Therefore, it is necessary to select a proper mixture, e.g. aggregate and cement.
The use of the vibro replacement/stone columns leads to comprehensive improvement of the soil parameters, which results in significant reduction of total and differential settlements. In addition, the columns may act as a drainage after their installation. The Stone Columns are typically installed under the structures such as storage halls, shopping centers, residential buildings, container terminals, road and rail embankments and many more.
Typical loads transferred by the column amount to 250 kN. The columns are arranged in a square or triangular grid with a side length ranging from 1.5 m up to 3.0 m so that the soil replacement factor is within the range from 15% up to 35%.

Projects

Enclosed buildings:

Shopping centers, halls, warehouses:

- Construction of LIDL store, Katowice, approx. 1,700 lin. m.
- Construction of Selgros wholesale, Gliwice, approx. 6,000 lin. m.
- EUROPA Shopping center, Gliwice, approx. 18,000 lin. m.

Infrastructure:

Road and rail embankments:

- Jarosław ring road, approx.9,500 lin. m.
- Ełk ring road, approx. 2,500 lin. m.
- Karczemki junction, Gdańsk, approx. 3,500 lin. m.
- Regional Road No. 241, Wągrowiec ring road, approx. 4,500 lin. m.

Special structures:

Wastewater treatment plants, silos, tanks, wind farms:

- Baltic Arena II stage, Gdańsk, approx. 18,000 lin. m.

Advantages:

- **High bearing capacity** – the high shear strength and low deformation capacity of the columns formed in weak soil.
- **Comprehensive improvement** – the improvement of mechanical properties of the soil between the columns, and while forming the column by swelling / compacting of the soil as well as after completing the column formation when the column act as a drainage (accelerates the consolidation time).
- **Environmentally friendly** – the vibro replacement/stone columns can be formed of recycled material (crushed concrete, etc.).
- **High performance** – the SC technology is highly efficient reaching even several hundred of linear meters of the installed columns per shift (with the use of a single unit).
- **No spoil** – in the course of the column formation the surface soil structure is undamaged and there is no excavated material. Hence, no need for removal of earth mass.

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