



TECHNOLOGY

Discrepile

Displacement piles







Absence of debris

No vibrations or impulses during construction

Drilling without bentonite support

Pile diameters from 300 mm to 800 mm (depending on soil type)

Maximum pile depth about 30 m

If soil removal has to be minimized during foundation works, displacement piles can be the solution.

Trevi has fine-tuned a technology combining the absence of debris typical of driven piles, with the speed and low cost of continuous flight auger piles.

Thanks to powerful drilling rigs and suitable tools, the Discrepile technology allows to drill foundation or consolidation piles in suitable soils, also in the presence of aquifer, thus significantly reducing the problems and costs associated with the disposal of cuttings, as it is the case in other technologies.

The use and effectiveness of this technology depends in the first place on the type of soil to drill, and secondly on the equipment and tool used. To drill a displacement pile, soil must be "compressible". By this term it is generally meant cohesive or non-cohesive soils meeting the following parameters:

- **cohesive soils** with undrained shear strength $C_u < 100-120$ KPa

- **non-cohesive soils** - mainly loose sandy soils - with relative density $D_r < 65\%$

Nonetheless the Discrepile technology can also be used in "non-displaceable" soils, provided that max layer thickness is 1-1.5m within the compressible material, or that it is the material in which the pile is socketed.

In both cases, a specific tool can be used to move non-displaceable material to the upper compressible layers.

Depending on soil stratigraphy, the Discrepile technology allows to drill piles of a max length of 30 m and nominal diameters ranging from 300 to 800 mm.

Technology and working sequence

The Discrepile technology working sequence encompasses the following steps:

- **driving by a combination of rotary and crowd forces** of the tool connected to the rotary head via a drill string
- **tool withdrawal and simultaneous concreting** up to the ground level, seamlessly, through the hollow centre of the drilling string
- **installation of the reinforcement cage** through fresh concrete.

To ensure the fast positioning of the cage into fresh concrete, the latter should have the following features: aggregates with a diameter of max 18 mm and S5 or SCC slump classes shall be used.

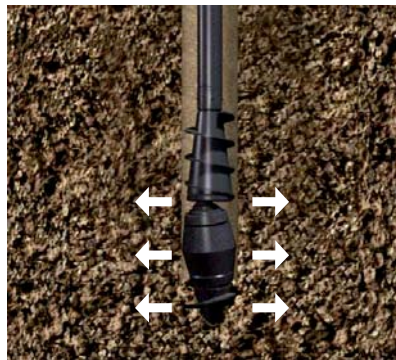
When using S5 concrete with slump higher than 220 mm, the max cage installation depth is usually 12-15 m, whereas when using SCC concrete it is possible to apply cages to piles as long as 30 m in favourable conditions.

Pile concreting is realized using a tracked concrete pump with an output ranging from 80 to 120 m³/h.

The reinforcement cages for Dicrepiles must be assembled respecting a number of principles: the bottom part must be conic-shaped to facilitate driving and hole centring, whereas the cage body must be strengthened with bars of suitable diameter. Minimum concrete layer must be about 7.5 cm.



Working sequence



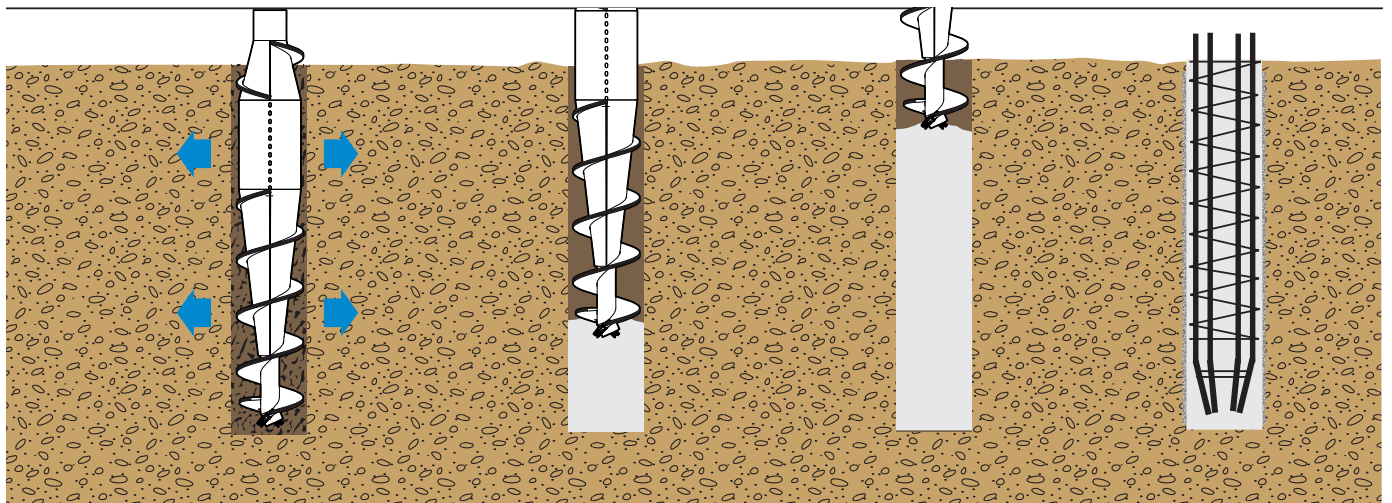
STAGE 1
DRILLING



STAGE 2
TOOL WITHDRAWAL AND
SIMULTANEOUS CONCRETING



STAGE 3
REINFORCEMENT CAGE
LAYING



Main fields of application and advantages



The Discrepile technology is increasingly used for foundation works for example polluted sites where it is advisable not to produce debris.

Moreover, the request for sustainable and low environmental impact technologies in urbanized environments or reserve areas, with no vibrations, percussions or impulses, make the Discrepile technology preferable to other techniques in which material removal is not allowed (*driven piles, vibrated piles*).

In terms of bearing capacity, DISCREPILES are similar to driven piles. In granular soils, they cause a build-up and improve soil mechanical properties, and as a result the increase bearing capacity of the foundation element with the advantage of no vibrations or impulses.

In suitable soils, productivity is usually very high and costs are limited.

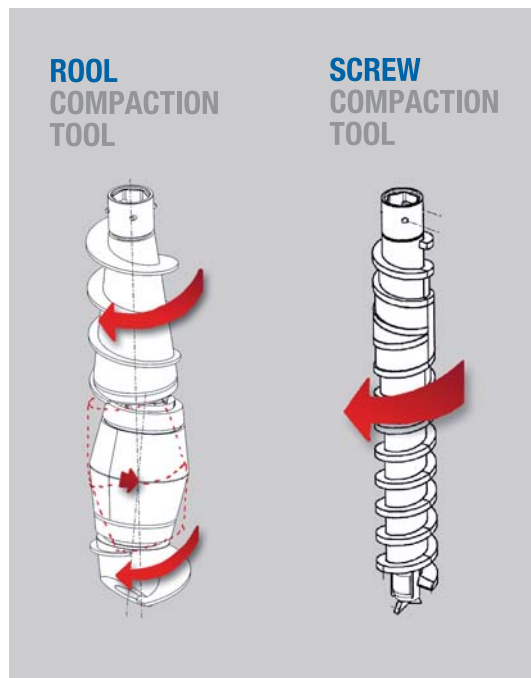


Tools

Technological research allowed to implement different types of tools specially designed to improve the final bearing capacity of the pile, considering the soil geological features.

Today, three types of Discrepiles are identified:

- **CDSP** (*Cylindric Displacement Pile*), built by means of a spindle-like or elbow-like tool, preferably in non-cohesive and granular soils;
- **SDSP** (*Screw Displacement Pile*), constructed by driving a screw-type tool which can screw/unscrew into the soil. In this way, an irregular lateral surface is created and the pile bearing capacity is improved;
- **TCT** (*Traction Compacting Tool*) pile.



Tools are selected depending on soil features:

- 1- CDSP
- 2- SDPS
- 3- TCT

Equipment

For the construction of Discrepiles, the jobsite has to include a **drilling rig**, a small-sized **tracked hydraulic pump**, a **backhoe excavator** for debris handling and an **auxiliary crane** for cage positioning, if needed.

For this technology, Trevi has adopted high power self-elevating crawler-mounted hydraulic drilling rigs with high torque and crowd values.





World leader in ground engineering, Trevi has been working for more than 50 years throughout the world, strengthening its ability to provide solutions to any ground engineering issues. Trevi works in the field of special foundation, soil consolidation, dam remedial works, tunnel construction and consolidation, marine works, rehabilitation and cleanup of contaminated sites and construction of underground automatic multi-storey car parks. Trevi is committed to continuous innovation and search for solutions to complex problems of civil engineering worldwide. Experimenting cutting-edge technologies, entrepreneurship and investing in research and human resources are the strengths of a company based in more than 30 countries.



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