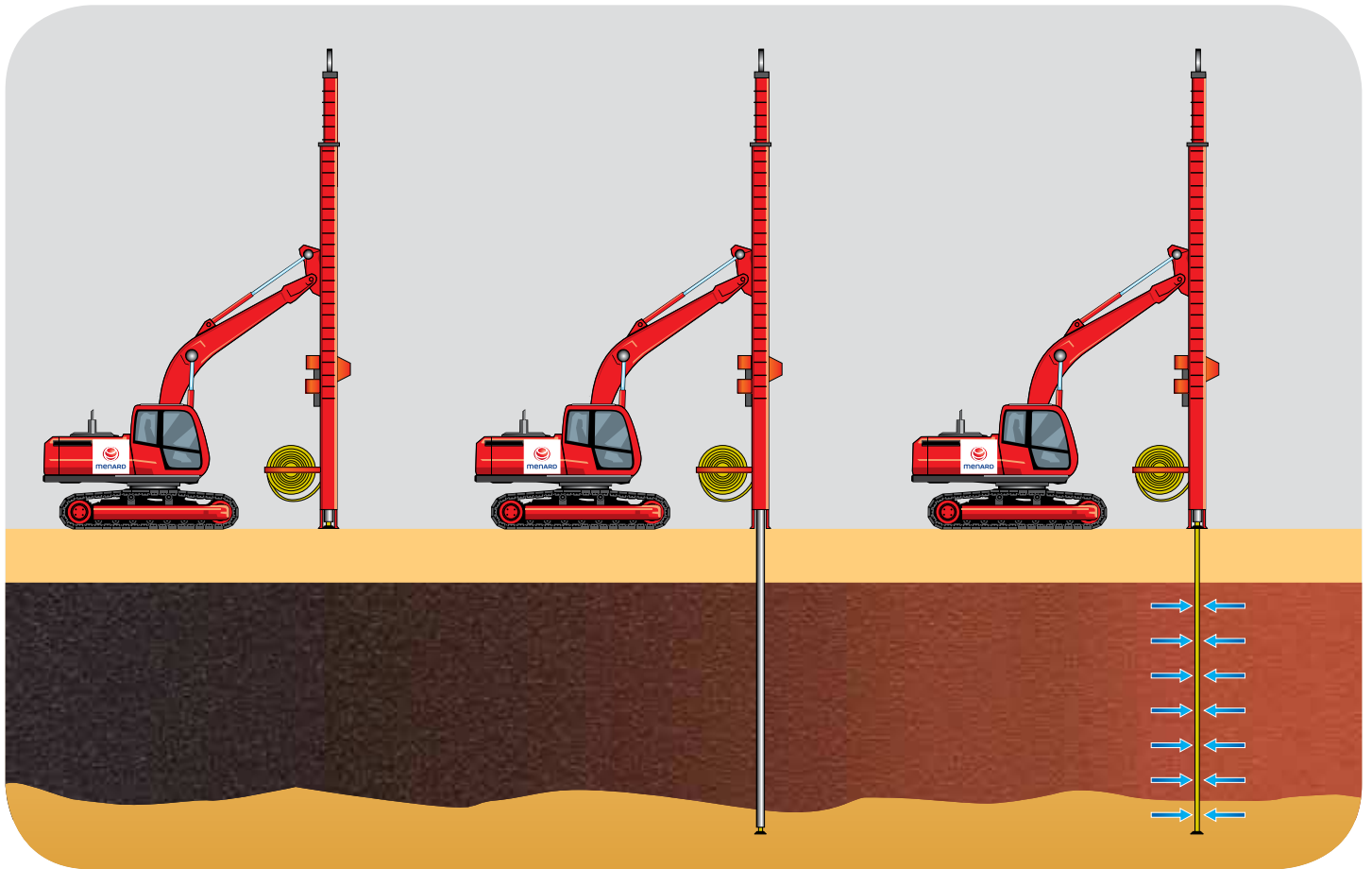


Vertical Drain (VD)



ground improvement specialists

The Vertical Drain technology is closely related to the consolidation phenomenon (*). Often applied with the preload fill is one of the most reliable and certainly the most economical method of the soil improvement.



Technology specification

Prefabricated vertical drains are long flat tubes consisting of perforated plastic core with a synthetic surround (geotextile) with a width of 100 mm and with a thickness ranging from 3 up to 4 mm.

The VD technology consists of the vertical drain installation in the soil. A specially constructed mast with a steel mandrel installed on an excavator pushes prefabricated drains to a certain depth. Then, the drain is cut off approx. 15-20 cm above the working platform.

Depending on the type of the project, the subsequent construction stages are strictly related to the applied technology of the vertical drains, e.g. for linear facilities (embankments) these are: placement of a sand layer with high filtration coefficient, construction of the embankment, placement of preload embankment (usually 2.0 to 3.0 m high), settlement monitoring within the estimated time of the consolidation (usually 3 to 5 months), removal of the preload embankment. For large spatial facilities and enclosed buildings the Menard Vacuum or Dynamic Compaction technologies are applied depending on the soil properties and acceptance requirements.

* The consolidation is a soil compression process under its own or external load. The mechanism of the consolidation is based on the reduction of the pore space (hence the volume of the soil) combined with the squeeze out of water from the solid phase. Various mineral soils (particularly important in case of clays and other cohesive soils) as well as organic soils (e.g. peat, gyttjas and others) are prone to consolidation.

Application

In case of implementation of the projects over time, in stages, the application of the vertical drain technology can be very efficient and economic. Therefore, the most common application is the linear infrastructure such as road or rail embankments. The Vertical Drain technology is used in combination with other Menard technologies, e.g. Menard Vacuum Consolidation or Dynamic Compaction. The vertical drains condition the soil by accelerating the rate of consolidation. Often, the Vertical Drain method is the only alternative for deep pile foundation especially when organic soils with substantial moisture content and thickness exceeding dozens of meters occur. Lengths of the drains may reach even 50 m. The Vertical Drain technology can be applied not only to organic soils (peat, aggradate mud, gyttjas), but also to cohesive soft soils (loams).

Depending on the geology and project requirements the drains are placed in the 0.5 m to 1.5 m spacing.

The maximum load transferred to the consolidated soil (after draining) depends directly on the type, degree of consolidation, structure type and acceptable settlements.

Projects

Infrastructure:

Road and rail embankments:

- South ring road of Gdańsk, approx. 3,500,000 lin. m., approx. 320,000 m²
- Kraśnik ring road, approx. 18,000 m²





Advantages:

- **Economy** – the main idea behind the Vertical Drain technology, which is the maximum possible use of the soil bearing capacity, makes this technology one of the most economical technologies of the soil improvement.
- **Environmentally friendly** – while installation of drains no concrete or cement injections are used.
- **Organically checked** – the simplicity of implementation makes this technology efficient for the use in organic soil with high moisture content which has been thoroughly tested in various applications.
- **Predictable** – long experience and thorough soil testing allow for precise estimation of settlement rate and consolidation time.
- **Scale of operation** – one of the few soil improvement technologies used for low bearing capacity soils with considerable thickness, even up to a depth of 50 m.

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